ELECTRICAL REVIEW

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The Production Drive

Overcoming Labour Shortage

MUCH has been said, and continues to be said, of the need for raising our production to a much higher level than it reached before the war and maybe readers are getting a little tired of having it drummed into them. Nevertheless the matter is such a real and vital one that we hope to be excused for dealing with it once more.

It is common knowledge that the "invisible exports" which used to redress the adverse balance between physical exports and imports of this country have been drastically reduced. The only way in which we can pay for the food and raw materials which we need from overseas is to increase our exports; the "target" figure is 75 per cent above the 1938 volume. But while we are doing this we have also to provide houses and the equipment for them; to grow a large part of our food requirements; to repair the ravages of war; to provide essential replacements; and do something towards satisfying the needs which have accumulated during seven years of abstinence.

Comparison with 1939

It is quite obvious that the achievement of these aims will demand a labour force much greater than we possessed before the war. In June, 1939, the total working population was 19,750,000 (including 1,270,000 unemployed). By June, 1943, the total had risen to 22,281,000 but in February last it had fallen back to 20,695,000. These figures include those in the Armed Forces and civil defence services; actually the numbers engaged in industry fell from 17,923,000 in June, 1939, to 16,245,000 in February last.

There is a present reservoir of about 3,000,000 in the Services and this can be drawn upon so far as our commitments allow, and it is possible that women and older men may be attracted back into industry. But aid from these directions will be totally insufficient for the immediate needs. What other resources are there? Imported labour (particularly for agriculture) may help but this is unlikely to be maintained in great numbers for very long.

Electrical Industry's Position

Thus there will be a deficiency which cannot be made up by recruitment. But the preservation of our standard of living (and maybe our existence as an industrial nation) is involved. The only possible alternatives are greater efficiency of production and greater output per head. The electrical industry is a leader in industrial efficiency; it is a "new" industry employing modern methods. But even so there may be directions in which a tightening-up will bring about improvements. Men and women employed in the industry, generally speaking, are of the best types and they work under conditions as good as any. If they are brought to a full realization of the problems and the needs they will respond with greater efforts to meet the demand upon them.

The Government has embarked upon a great production drive designed to impress employers and workers with the magnitude and urgency of the requirements. We ask

the Government, for its part, to see that electrical manufacturers, whose products form the basis of industrial efficiency and labour economy, are not hamstrung by being deprived of their draughtsmen, designers and other "key" men. Upon these, many other workers are dependent, and their withdrawal means severe dislocation and loss of productive power.

Future Corporate Members

TAKING a long view one of the most important activities of the Institution of Electrical Engineers during the past year has been the setting up of an advisory service for graduates and students with a view to aiding their eventual qualification as associate members. It is to be hoped that full advantage will be taken of this opportunity for professional advancement by the younger men. It is, however, disquieting to learn from the Council's Report, particulars from which are given in this issue, that the Students' Lectures were not always well attended, even though those who were present were keenly appreciative. The subjects may not have been in the particular field of many students, but they were well suited to give a wider view of the engineering horizon, and too early specialization is a mistake.

Wholesalers and Purchase Tax

A FIRM of electrical wholesalers has expressed the view to us that manufacturers might indicate on their invoices whether the goods concerned are subject to purchase tax which, we suppose, would also involve stating the rate of tax. Most people would consider it part of the wholesalers' job to keep themselves up to date in this subject and if they are members of the Electrical Wholesalers' Federation they are well served in this respect. We know of one large electrical manufacturing company which circulates a list to its customers showing the goods to which purchase tax applies, but we doubt whether all manufacturers would be willing to undertake this task and the responsibilities it may entail.

An Open Mind

FURTHER references to the nationalization plans have been made by Government speakers in the past week or so. The Prime Minister, addressing a Newcastle meeting, made it known that Bills for the nationalization of gas, electricity and transport were "in course of preparation." A similar statement was made by the Minister of Fuel and Power at a luncheon in connection with the Southampton undertaking's jubilee. From Mr. Shinwell's later remarks, however, it appears that the Government have not yet formulated detailed proposals, for he declared that until they had met the interests concerned they would preserve an open mind, apart from the principle which guided them. Whatever the new dispensation was, he said, the services of the eminently able technicians in the industry must be retained.

Appliance Production

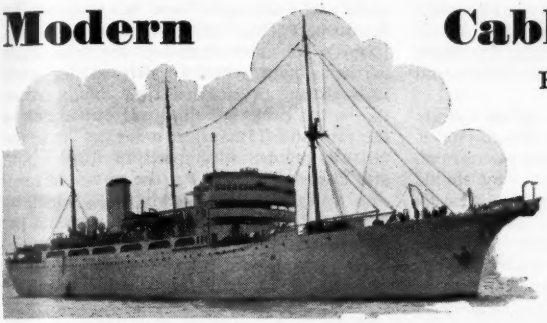
DURING the last quarter of 1945 the production of electric fires, mainly for the home market, made a substantial advance on the figure for the preceding three months; the monthly average rose from 40,900 to 122,000. The latter figure was above that for 1935, the only pre-war year referred to in the April *Monthly Digest of Statistics*. There is little doubt that the demand was stimulated by the coal shortage and added to the peak-load burdens of the electricity supply system. The rate of production of irons in October-December was more than double that of the preceding quarter and 50 per cent above the 1935 level; the monthly average was 170,100. Vacuum cleaners and kettles made a substantial, though smaller, advance, the rate of production being respectively 20,400 and 22,000 per month.

Electricity for New Towns

OPPORTUNITY is given by the plans visualized in the New Towns Bill for an interesting experiment in total electrification. Instead of expensive piecemeal development, it should be possible to equip the proposed new towns with a complete distribution system designed to meet all possible requirements for many years. Although the cost of equipment and materials will be at post-war levels, thus militating against the reduction of distribution costs per kWh, there should be a considerable saving in labour costs as compared with older systems. Power for the new towns would probably be provided from the grid, but a fully-electrified town with a population of 50,000 (which is the proposed size) might have its own power station. It should not be necessary to erect a gasworks too.

Modern Cable Ship

Handling Arrangements in the "Monarch"



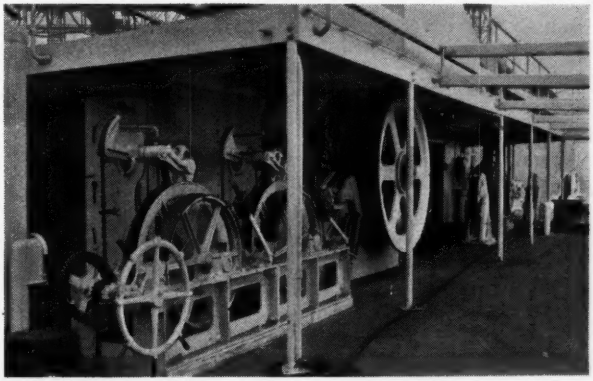
THE largest and most modern telegraph ship in the world, for laying and repairing submarine cables, H.M.T.S. *Monarch*, has been completed for the Postmaster-General by Swan, Hunter & Wigham Richardson, Ltd., and has just carried out sea trials in boisterous weather. She is 475 ft long overall, of 55 ft 6 in. beam, with a draught of 27 ft 6 in. when fully loaded and a gross tonnage of 8,050.

This fine vessel is distinguished for her electrical equipment, greatly improved layout and appointment of living quarters, general spaciousness and tall superstructure. She can accommodate a complement of 160, or remain at sea with 130 on board for 100 days without refuelling or entering port. Loss of weight when laying cable (5,000 tons) and consumption of fuel oil (2,000 tons) and water (1,000 tons) carried in the double bottom has necessitated special arrangements for water ballasting to maintain stability, aided by bilge keels projecting 24 ft outward from the vessel's sides.

There are four cylindrical cable tanks, each 41 ft in diameter, with a coiling capacity of 125,000 cu ft, or about 2,500 nautical miles of deep sea submarine cable, sufficient to lay a cable between England and America in one voyage.

The cable tanks are forward of the machinery space aft, which accommodates four oil-fired cylindrical Scotch type boilers with forced draught and two-stage feed heating. Two triple expansion steam engines totalling 5,000 H.P. at 110 r.p.m. drive twin propellers (14·5 knots) to ensure manœuvrability for cable laying. An overhanging stern carries tripole bow sheaves and the cruiser stern has one sheave on the port side.

The cable gear has been made by the Telegraph Construction & Maintenance Co., Ltd., with electrical equipment operating on the constant-current system supplied by the British Thomson-Houston Co., Ltd. The combined picking-up and paying-out gears, with dynamometers port and starboard, have drums 5 ft 8 in. in diameter and 1 ft 9 in. wide fitted with cast steel spur rims and double helical teeth shrouded to their tips; the rims act as brake drums with wood-lined shoes and water-jacketed braking straps. The gearing and shafts are so arranged that the driving pinions on sliding bearings may be completely drawn out of mesh with the drum spur rims by clutch mechanism sliding



View of paying-out gear, showing lead sheaves, dynamometer and stern gear

on double feathers, actuated by hand wheels and screws, so that either of the two sets of spur wheels can be put in gear for drum surface low speed with 26 tons strain and fast speed with 6 tons strain.

The two 160-H.P. driving motors operate on the series constant-current system (300-A d.c. circuit) without individual starters. Forward and reverse control is by simple telegraphs on deck with small rheostats below deck for regulating the motor fields, which are energized separately from the ordinary 220-V d.c. ship's mains. Thus finely graded adjustment of torque is possible for hauling or braking. Motor torque can be maintained at its maximum at standstill, thus enabling the control rheostat to be set for any required degree of braking up to standstill. Motor torque can then be further increased to provide more picking-up speed until maximum torque is exerted.

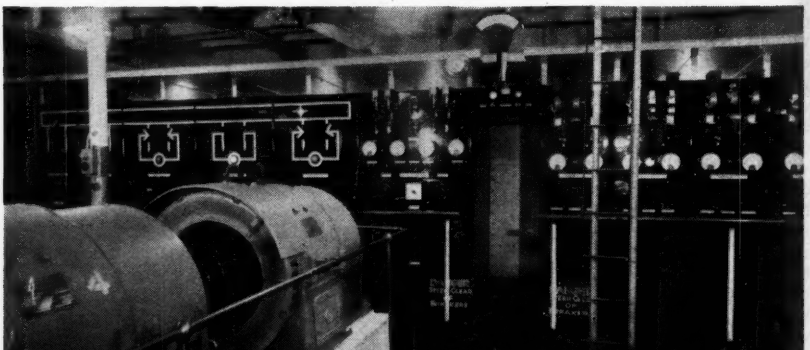
Port and starboard draw-off gears with side brake drums free-wheel when paying out and when picking up are driven by bevel rim with short diagonal shaft leading through the upper deck with bevel wheel and pinion at the upper end. The approximate weight of the complete forward gear is 35 tons.

The aft gear for paying-out submarine cable is of tank form, supporting a pair of plummer blocks carrying the main shaft. Four brake wheels within the frame are each 6 ft in diameter by 1 ft wide, fitted with brake straps with pendant weights. The brake relieving gear can be actuated by hand-wheel from within the drum room lobby. The inboard end of the main shaft carries a spur wheel to drive a fan shaft through an all-enclosed train of gears so that when cable is being paid out to sea at the rate of 8·75 nautical miles per hour the fan will revolve at a speed of 1,000 r.p.m. and absorb 120 B.H.P.; the power absorption can be varied down to 27 H.P. by adjustment of the envelope from within the drum room lobby.

On the outboard end of the fan shaft is an 80-H.P. motor, operating on the constant-current system, which functions as a turning gear for working the paying-out machinery in either direction, or for regenerative braking if desired. The motor can be disconnected from the fan shaft by a clutch. There is another clutch of the multiple disc type, oil immersed, in the hub of the spur wheel on the main drum shaft, so that the fan brake may be entirely disconnected from or engaged with the strap-wheel brakes within the tank of the paying-out gear.

Dynamometers are of improved pattern; there are tachometers, revolution counters, a slackometer, and the cable test room is furnished with a very complete set of measuring instruments.

The *Monarch* is the first cable ship to have electrically-driven cable gear, the turbo-generators, switchboards and constant current motors being of the British Thomson-Houston Co.'s make. The d.c. generators



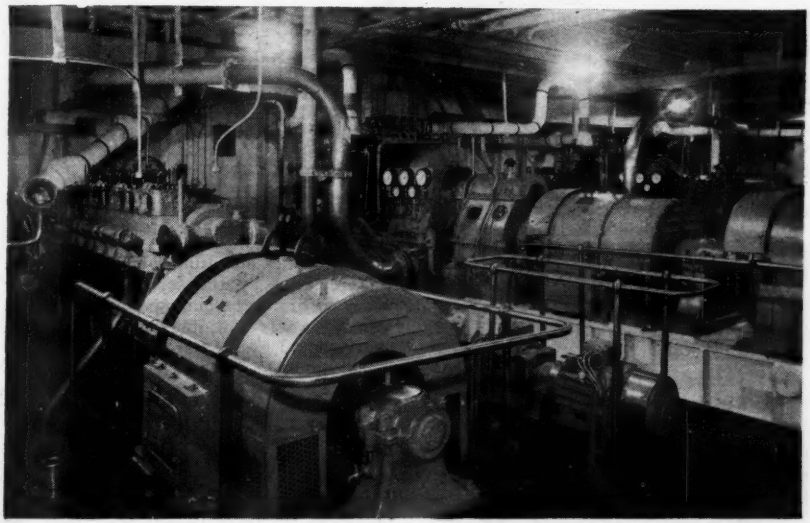
Part view of engine room switchboard, showing "Amplidyne" continuous current panels on left

are identical and interchangeable; all can be paralleled at constant voltage on the main switchboard, while three of the six sets can be used for the constant-current circuits, maintaining 300 A steadily through the armatures of the motors, which are all in series. The torque they exert is proportional to the applied field; if the turning effort is insufficient to move the load the motors remain "stalled" indefinitely without risk of damage. Increase of field excitation (derived separately from the ship's mains) sufficiently for the motors to overcome their

same size and type are each driven by a Diesel eight-cylinder Paxman-Richards oil engine for use in emergency, or when the main steam generators are not operating in port.

The constant-current machinery totals 365 H.P., distribution being by two ring mains, one forward and the other aft; in addition there is 190 H.P. for the Clarke, Chapman anchor windlass and capstans, which are fitted with Laurence, Scott constant-current motors and controllers.

Such other plant as cargo and boat winches,



Part view of generator room, showing Diesel, "Amplidyne" and steam turbine sets

loads enables them to pick up speed. Thus flexibility of control is obtained very economically and effectively by simple variable resistances inserted in the motor field circuits, which carry relatively small currents.

The generators develop only 10 to 15 V at no load, but respond quickly to furnish more voltage to keep 300 A circulating when the motors start, their excitation being appropriately adjusted automatically on the "Amplidyne" principle, for which purpose two machines are installed.

The generating plant is in duplicate; there are two B.T.H. 225-lb steam turbines, each geared (8,000 to 1,300 r.p.m.) to two 100-kW (455-A) compound-wound dynamos in tandem. In addition two dynamos of the

ventilation fans, pump motors and auxiliaries are energized from the normal 220-V d.c. mains, the extensive wiring installation having been carried out by Campbell & Isherwood, Ltd., of Newcastle-on-Tyne; 65 per cent of the wiring is executed in "Pyrotenax," the balance being v.i.r. or cambric-insulated cabling.

There are about 1,500 lighting points throughout the ship; intercommunicating, navigational and cable-working telephone systems, ship-shore P.O. telephone circuit, electric telegraphs for conveying navigation and cable-laying orders, radar and wireless telegraphy equipment, pitometer and Walker's log circuits, three types of echo sounding gear, as well as a separate system for telephones, cabin bells, telegraphs and

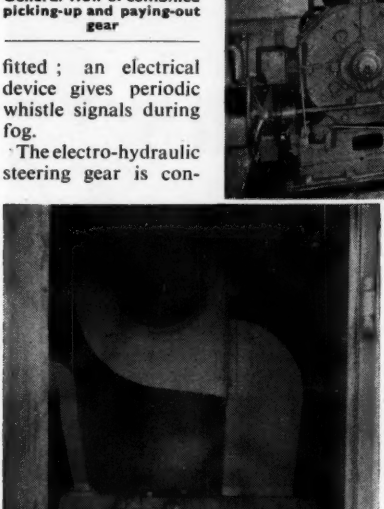
other low-voltage circuits energized by two motor-generator sets, in a special compartment, which also furnish 30 V for operating searchlights.

The engine room and cable gear telegraphs are of the Siemens electric type while the engine room revolution telegraphs are of Chadburn's Navy type; Siemens electric helm indicators and Record electric engine revolution indicators are fitted; an electrical device gives periodic whistle signals during fog.

General view of combined picking-up and paying-out gear

The electro-hydraulic steering gear is controlled from the bridge by telemotor gear, in addition to Sperry hand and automatic electric steering. The equipment in the main wireless room of the vessel consists of two telegraph transmitting sets and a low power telephone set.

The first *Monarch* was a small wooden paddle ship used for repair work and the first vessel permanently fitted as a cable ship. She was condemned shortly after the Post Office took over the submarine cables in 1870 and was replaced by the second *Monarch* in 1883, the first to be built specially as a cable ship. She was sunk in 1915 by a mine and was replaced by the third *Monarch* in 1916 which suffered a similar fate in 1945.



Constant-current 80-H.P. turning gear motor for cable laying fan brake

A.S.E.E. Branch Papers

THE Examining Board has now issued its decision in connection with the Branch Papers Scheme of the Association of Supervising Electrical Engineers for the year 1945-46, and has made the following awards:—First prize to Mr. G. H. Parker (Manchester) for his paper "The Electrically Heated Autoplate"; second prize to Mr. G. A. Onion (Birmingham) for his paper "Metal Spraying and Some Applications"; and third prize to Mr. R. Snell (Sheffield) for his paper "Electrical Resistance Thermometers." The three winners will be reading their papers at the Association's meeting on May 21st at the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2, at 6.15 p.m. The Examining Board was composed of Messrs. S. G. Christian, L. W. Medcalf, and F. W. Smith, and in their report they draw attention to the continued high standing of the entries, and the fact that this is the last year of this scheme, which commenced in 1941, when the W. E. Highfield Shield Competition was discontinued for the war period.

The Shield Competition has been reintroduced this year under which the membership is invited to submit papers not exceeding 2,000 words in length, dealing with the electrical industry and/or the Association. The closing date for entries is August 5th, and the Examining Board is composed of Messrs. E. R. Wilkinson, H. W. Swann, W. H. Brooks and E. J. Sutton.

Views on the News

Reflections on Current Topics

IN view of comments regarding the cost of running "all electric" temporary houses, I was interested to see that the Lothians Electric Power Co. has been carrying out special readings of meters at Musselburgh. Each house was fitted with 0·45 kW of lighting, 6-kW cooker, 3-kW wash-boiler, and 2-kW immersion heater, whilst there were no doubt radio sets, irons, radiators, etc., of which the company had not been notified. Readings showed that daily consumption varied from 3 to 12 kWh, the average being 5·37 kWh per day. Taking this for 365 days it worked out at 1,960 kWh per year, which inclusive of the fixed charge resulted in an overall cost of 1·08d. per kWh or 5¾d. per day. It seems reasonable enough to me.

* * *

I am always irritated (unreasonably perhaps) when laymen refer to the I.E.E. as the *Institute* of Electrical Engineers and really annoyed when members, as they sometime do, employ the same term. But imagine my wrath when I received the other day from one of the sections of the Institution a printed document in which the offending word appeared boldly at the top in large letters.

* * *

A few weeks ago in commenting on the comparatively small number of I.E.E. members who seemed ready to submit papers, I had older men more particularly in mind. The reasons suggested for this reluctance hardly apply in general to the 3,000 or so members of the London Students' Section, to whom the strain involved in preparing accounts of their technical experiences would be less and the reward in kudos would be greater. Yet Mr. R. V. Darton, the hon. secretary, has reason to complain in that his request for offers of papers to make next session's programme possible has so far met with no response whatever. If this hesitation to grasp the privilege of spreading knowledge is due to diffidence, it seems to be a case of "stepping o'er the bounds of modesty" in a direction contrary to that usually understood.

* * *

More evidence of the limitations of "electronic" cooking for domestic use, at any rate in its present stage of development, is given by Mr. J. C. Sharp, vice-president in charge of engineering, Edison General Electric Appliance Co., in an article in the American journal *Electrical Merchandising*. The first electronic cooker which his company has just produced is in appearance almost identical with the conventional electric cooker except for a few extra dials. If placed on the market, however, it would have to be retailed at $1,000, against $115, for the standard unit. Instead of being able to provide the great variety of methods of cooking available with the ordinary cooker the electronic cooker has only one to offer and this, though much quicker, is by no means always satisfactory.

Research into this new sphere of cooking would, says Mr. Sharp, have been quite discouraging except for the continual new developments in oscillators producing frequencies of hundreds of millions rather than hundreds of thousands of cycles. He comes to the conclusion, however, that the future of the electronic cooker for domestic use is doubtful, though there will be installations, commercial and industrial, where time, space or some other important factor will make high-frequency cooking desirable.

* * *

People who are accustomed to handling b.c. lamps without thought of danger often do not realize that precautions are necessary when dealing with the screw-cap type. They are quite safe when the lampholder is properly wired, i.e., with the live side of the circuit connected to the centre contact and the neutral to the screw part and an additional safeguard is the use of a skirted holder. Failure to pay attention to these points may result in nasty accidents, for the large-wattage lamps which have this type of cap are usually mounted high up, necessitating the use of a ladder when cleaning or replacing them; a shock may lead to a fall from the ladder. I would advise works managers to obtain from the Stationery Office (at 1d each) copies of a leaflet, Form 1911, prepared by the Ministry of Labour and National Service setting out "Precautions against Danger in the Use of Screw Cap Electric Lamps."

* * *

One of the reasons for the hesitancy of some local authorities to back nationalization of electricity supply wholeheartedly is the possible loss of rate relief. I was not surprised to hear, therefore, that the Institute of Municipal Treasurers and Accountants has under consideration "the financial consequences of the severance of the undertakings from local authority control." It seems to me that it will be difficult to justify a continuance of the subsidization of local rates by electricity consumers but no doubt an endeavour will be made to secure it.—**REFLECTOR.**

Photometric Curves

Some of Their Useful Applications

By H. G. Batson, *Associate I.E.E.*

THE illuminating power of fittings employed for directly lighting the interiors and exteriors of buildings is not uniform in all directions. Fittings may conveniently be compared by reference to graphs showing angular deviation of light output from an axis of symmetry or a plane of direction.

The data which the curves record are useful for comparing the distribution of light from different fittings, comparing their illuminating powers, classifying fittings, estimating the correct spacing-height ratio to use with particular types, comparing the efficiency of similar fittings, calculating the efficiency of a particular unit and the illumination resulting at any point by using a particular unit.

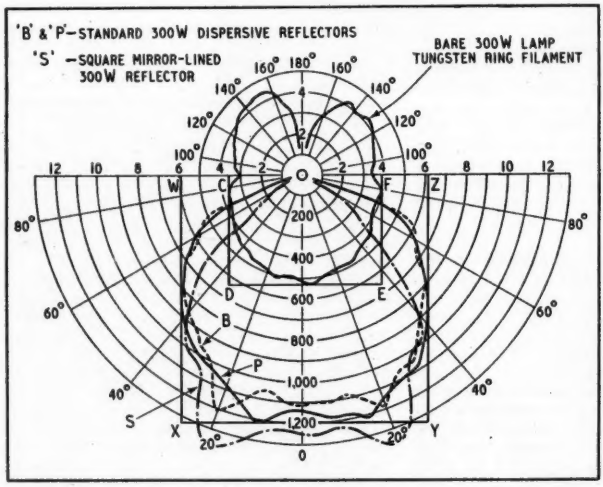


Fig. 1.—Polar co-ordinate curves of illumination

In polar co-ordinate representation the required variable is measured along a single line scale which is free to rotate about one end. The known factor is represented by the angular displacement of this vector scale from an arbitrary starting point, or zero.

The curves " B " and " P " shown in Fig. 1 relate to sample 300-W standard dispersive reflectors of different, but very well known makes. In their superposed position they form a good example of the first two of the uses. For this type of reflector BS.232 provides that " where polar curves are given, the candle power values shall be adjusted to conform to a light source having a light output of 1,000 lumens." This is of help when making precise comparison of the distribution characteristics of fittings using sources of different light outputs. However, to most users comparison of illuminating power and distribution characteristic made together is far more useful. Thus a curve of actual candle power values is much to be preferred for general publication. The accompanying curves show actual c.p. values and may be used for all purposes without multiplying by 4·72. The curve " S " relates to a square, silver-mirror lined, dispersive type fitting (300 W) such as is commonly used for high-wattage specular lighting and for flood-lighting. The unmarked curve is a copy of that taken from the bare lamp used for the test giving curve " B."

The frame ratio of the " polar curve " is used for classifying lighting units and for

TABLE I

Term	Frame Ratio Limits		Zone of Maximum Illuminating Power Degrees
	Above	Up to	
Extra Narrow ..	—	0·18	0 to 5
Narrow	0·18	0·8	0 to 24
Intermediate ..	0·8	1·4	0 to 45 or 180 to 135
Wide	1·4	3·0	0 to 90 or 180 to 90
Extra Wide ..	3·0	—	48 to 90 or 130 to 90

finding the correct spacing-height ratio for their use. Imagine a rectangle drawn around, and just enclosing, the portion of a polar curve within the hemisphere of major flux distribution (rectangle CDEF) so that the axis of symmetry forms a diameter. The ratio which the width of this rectangle across the axis of symmetry bears to its height along that axis is the "frame ratio." The frame for curve "P" is rectangle WXYZ.

BS.398, 1936, classifies light distributions as in Table I and these terms and limits may be employed properly for classifying units as narrow beam, wide beam, etc.; the following will illustrate the principle :—

Where an illumination uniformity of 50 per cent is desired a spacing-height ratio of 1·5 may be used with fittings having a frame ratio above 0·7 up to 0·9. If a uniformity of 70 per cent is required the appropriate fittings will be those having a frame ratio above 1 up to 1·33. These figures relate to the lighting of a plane which is perpendicular to the axis of symmetry of the unit.

When estimating the performance of a lighting unit it is convenient to refer to a graph plotted upon a foundation of rectangular co-ordinates, which facilitates the reading of values at angles further from the axis of symmetry. Fig. 2 shows, in half curves, the data from Fig. 1 plotted in this manner. The advantage of more accurate reading is immediately seen. For interest the beam curve of a 300-W plated-metal projector and a plot of curve "S" (both to one fifth of the candle power scale) have been added.

TABLE II

Russell Angles Degrees				
18·2	56·6	81·4	104·5	130·5
31·8	63·3	87·1	110·5	138·6
41·4	69·5	92·9	116·7	148·2
49·5	75·5	98·6	123·4	161·8

The performance of a unit may be estimated either from the average candle power produced at twenty precise angles, the Russell angles, or from the average candle power over consecutive arbitrary angular zones. If the average candle power at the Russell angles is multiplied by 2π the result will be the flux emitted by the unit (Table II) in lumens. These angles are very difficult to determine with accuracy from a graph drawn to a reasonable scale and the candle power values at those points are even more difficult to assess. Thus the second method is to be recommended.

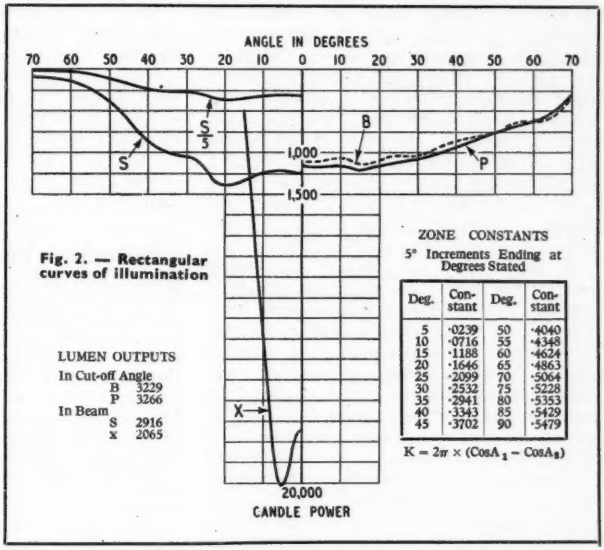


Fig. 2. — Rectangular curves of illumination

The total flux, in lumens, emitted by a lighting unit may also be determined (with an accuracy limited only by the accuracy of the graph) by adding together the products of multiplying the average candle power over each of a series of consecutive arbitrary angular zones by an appropriate "zone constant"; the smaller the zones, the more accurate the result.

To find the constant for any zone, starting fron the axis of symmetry, subtract the cosine of the vector angle ending the zone from the cosine of the angle commencing the zone and multiply the result by 2π. The product is the zone constant for that angular zone. Thus for a zone from 10 to 20 degrees the constant is given by 2π (cos 10 = cos 20). Fig. 2 records lumen outputs for the fittings

represented, calculated by this method. A table of zone constants for angular increments of 5 degrees is also given.

This method permits comparison of fittings having similar distribution characteristics, which, on a percentage basis, is well within the usual limits of engineering accuracy. It also gives a very close approximation to the true efficiency of a unit when the angular increments are taken sufficiently small and care is exercised in estimating the average candle power over the zones. The zone constants are the areas of the surface of a sphere of unit radius lying between the stated angular limits. This explains why a small candle power at a high angle may represent more light than a much larger power at, or near, the axis of symmetry.

A single curve can portray a complete picture only when the distribution of light is completely symmetrical around some axis. Thus with a fitting which is itself completely symmetrical, but is used with an asymmetric source (tungsten lamp), comparison will only be valid when the curves relate to the same vertical plane through the light source, as was the case with curves "B" and "P." When the distribution is not completely symmetrical, especially with an asymmetric unit, it is necessary to study two or more curves recorded in different vertical planes. Curves of the nature described only give true results when they are plotted from readings taken at a distance from the unit which is large by comparison with the diameter of the unit's aperture.

Standardization of Practice

The considerations on which this article is based suggest that there is room for standardization of practice or procedure on the following lines :—

Photometric curves published for the information of "users of light" should always record actual candle power values; they should in every case be calibrated and, further, a table of the readings from which the curve was plotted should be included in the diagram.

Photometric curves published in accordance with BS.232 should be to an agreed scale of circular increment; for general-purpose fittings, such as dispersive reflectors, each concentric circle could represent a power increment of 5 candles.

Photometric curves relating to such sources as tungsten lamps should always be taken in an agreed vertical plane in relation to the filament, or other source of light; the position of this plane should be recorded on all curve sheets (see Fig. 1). The curves should always be plotted from readings taken at an agreed distance in relation to the width of the aperture of the unit.

BS.398 when revised should permit of the data being recorded in a form suitable for reference by "users of light," as does the present addition, and the feature whereby the calculated spacing-height ratio is related to desired uniformity should be retained. Provision should be made for units with symmetry of distribution about two planes, as well as for those with complete symmetry about one axis.

Rateable Value and E.P.T.

IN a King's Bench Divisional Court on April 30th the Lord Chief Justice (Lord Goddard) and Justices Humphreys and Singleton upheld a decision of the Appeals Committee at Taunton Quarter Sessions, that the South Somerset & District Electricity Co., Ltd., were entitled to deduct excess profits tax from the profits of their undertaking in arriving at the rateable value of their various premises in the area of Yeovil Rural District Council.

The company had objected to proposals for amendment of the Valuation List, which had been supported by the Somerset County Valuation Committee before the Assessment Committee. On the appeal of Yeovil Rural District Council to the Quarter Sessions, the company's submission that excess profits tax, which had been paid, could be properly deducted, was upheld on the basis of a decision by a King's Bench Divisional Court in 1919 when dealing with a similar case.

It was argued on behalf of the Council that the decision of the Appeals Committee was wrong, but the Court dismissed the appeal of the Council.

The Lord Chief Justice, in giving judgment, said the Court was bound by the decision of 1919. He added that the decision was doubtful. The point however was not open to the appellants, though it could be argued before a higher Court. It might be that another Court would hold that, while the whole sum of excess profits tax paid could not be taken into account, the fact that such tax was payable might be taken into account.

Leave to appeal further was granted.

Coreless Induction Furnaces

Referring to the report of the discussion of Mr. M. J. Marchbank's paper on "Coreless Induction Furnaces" in our issue of April 26th, Mr. W. Fordham Cooper tells us that he said than an earth leakage recorder should be used *in addition to* not *instead of* a relay.

I.E.S. Convention

Functions, Papers and Exhibition

By J. S. Dow

THE Convention of the Illuminating Engineering Society which takes place in London from May 14th to 16th is a noteworthy effort. Although annual conferences have been arranged for many years by the American Illuminating Engineering Society, with its larger membership drawn from a very wide area, this is the first time that the British Society has attempted anything of the kind.

The idea was being considered before the war. In the subsequent period the membership of the Society has been approximately doubled and seventeen centres and groups have been formed in many of the chief cities. The Society is thus in a stronger position to make the effort, though admittedly the fact that conditions have not as yet approached normal (notably as regards festive events) is something of a drawback.

The idea of the Convention arose largely out of the belief that a great deal of interesting and valuable experimental work on wartime applications of light had been done and might be forgotten if not put on record. It was also felt that the moment was ripe for members, who had been deterred from meeting one another during the war and who were now much more widely distributed, to gather in London.

Popular Talks

The Convention is to be opened on the evening of May 14th when there will be a reception by the president (Mr. H. C. Weston) at the Institution of Electrical Engineers, where meetings on subsequent days will also take place. Following the reception, the exhibition, to which reference will be made shortly, will be open and there will be a series of popular talks. Mr. R. A. Eshelby is to describe some of the ingenious efforts made by inmates of prisoners' camps to lighten their captivity by lighting effects. Mr. Crawford Sugg will describe, with illustrations, the part played by light in connection with invasion, and Mr. H. A. Ruff will show some experiments illustrating effects of ultra-violet radiation ("black light").

There will be two morning and two afternoon sessions, at which addresses will be given and papers read, on May 15th and 16th. On the Wednesday morning the annual general meeting (a feature of which will be a presentation to the retiring honorary secretary) will take place, following which addresses will be given on "Lighting during the War and After" (Mr. Percy Good) and on "Light and Vision" (Professor H. Hartridge). Mr. Good will review some of the special work done by the Society during the war, notably in connection with the design of wartime street lighting ("synthetic starlight") and may touch on some aspects of lighting in the future, more especially from the "amenity" aspect.

In the afternoon, when Sir Charles Darwin, Director of the National Physical Laboratory, will preside, a paper on "New Lamps for Old" is to be presented by Mr. L. J. Davies, director of the B.T.H. Research Laboratory, Rugby.

On the following day the Earl of Mount Edgcumbe will preside during the morning session. A paper on "Laboratory Technique during the War" will be presented by Messrs. W. R. Stevens and J. M. Waldram who will hold some interesting demonstrations, for example of the double projection method which proved so useful in forecasting the visibility of wartime street lighting when viewed from the air. Another paper, by Dr. S. English, will deal with the lighting of airports.

In the afternoon there will be papers on "Daylight and Town Planning" (Mr. W. A. Allen) and on "Fluorescent Lighting Practice" (Mr. W. J. Jones) both subjects very much in the public eye at the present time. This series of papers has been specially selected with a view to furnishing a review of present problems in the lighting field. Most of them lend themselves well to demonstrations.

The Exhibition

The exhibition, which is being arranged at the adjacent Lighting Service Bureau, will be open for inspection by non-members who are interested, during the period of the Convention. Tickets, admitting both to the exhibition and to the meetings, may be obtained from the hon. secretary of the Society.

The exhibition will be in the main devoted to applications of light during the war period and will illustrate many special researches of considerable interest. It will be essentially scientific in character. No names of firms will appear—in fact the various research groups associated with the lighting industry will be co-operating in the same wholehearted manner as they did during the war, when their team work had much to do with the signal success which attended many of their investigations.

Lighting in Wartime

It has been remarked that the contribution made by lighting to the war effort has been somewhat overshadowed by other more spectacular things, such as the development of radar and the atomic bomb. Nevertheless this contribution was very substantial. It is hardly necessary to stress the vital part played by good lighting in the factories concerned with national production, where the I.E.S. Code was generally applied. But there have been many other applications directly associated with operations of war. Amongst such may be mentioned the provision of light during invasion and the very specialized lighting of aerodromes, without which the landing of large numbers of bombers at night, without undue risk to the crews and without disclosing information to the enemy, would not have been possible.

During the period of the war the prevailing dense darkness at night led to the careful cultivation of night vision both by civilians and by those with special night-tasks in the Forces. In their work on wartime street lighting and aids to movement in the darkened streets, the Society had to make a study of the phenomena associated with the use of the eyes at very low illuminations. Another instance of such study is to be found in the process of training night-flyers under daylight conditions, the landing grounds being equipped with sodium lights and the pilots provided with special glasses opaque to other forms of light so that day virtually became night for them. For the dark-adapted eye much depends on elimination of dazzle—hence the need for special precautions in lighting the instruments used on aircraft or on the bridges of vessels at sea.

Camouflage, again, is an interesting study, not merely in connection with the disguise of buildings but in the treatment of ships at sea under variable atmospheric conditions. One other very curious and interesting development has been the application of stage-lighting technique to "synthetic training," i.e. the imitation, for trainees, of conditions they are likely to meet in actual warfare. In the production of these realistic effects lighting plays a great part.

The above are typical of special war technique in lighting, such as will figure in the exhibition. The display, however, which will comprise some fifty exhibits, will not be confined to such aspects. An endeavour will be made to show how lessons learned from wartime experience may be applied to practice in time to come. There will be exhibits illustrating the latest developments in industrial lighting, especially as regards the provision of a satisfactory background to the efforts of the workers, and the lighting of homes of the future.

Social Events

Linked with the meetings and the exhibition there are also social events and visits—the National Physical Laboratory is likely to be invaded in force on the Friday morning (May 17th). At the dinner-dance on May 15th the principal guest will be Mr. George Tomlinson, Minister of Works, who will propose the toast of the Society; Dr. C. C. Paterson, a past-president of the Society, will propose the toast of "The Guests."

A pleasing wind-up on May 16th will be an informal social evening, at which a burlesque pageant ("Lighting Through the Ages") is on the programme. It would be unfair to reveal the nature of this item in any detail, but the curiosity of I.E.S. members has evidently been aroused for it is reported that the demand for tickets already exceeds the available accommodation.

London J.E.A. Re-classification

UNDER existing arrangements the whole of the undertaking of the London and Home Counties J.E.A. is included in Class F of the N.J.B. Schedule. Following representations by the Electrical Power Engineers' Association, it is now proposed to re-classify the distribution districts of the Authority, with provision for the regrading of the technical staff within the new classifications, as from July 1st next.

The recommended new area classifications are as follows: Class H, Sutton. Class G, Twickenham. Class F, Dorking (and Leatherhead), Esher (and Weybridge) and Surbiton. The ultimate additional cost is estimated at £2,000.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

A Marconi Memorial

WITH reference to the question Mr. P. Freeman (Newport) asked in the House of Commons on April 2nd concerning the appropriateness of erecting a memorial to Marconi at the spot on the Penarth Cliffs where the first wireless message was transmitted by him to the island of Flatholm, and the reply of Mr. Burke, the Assistant Postmaster General, it may be appropriate to state the facts in regard to the Penarth experiments.

Marconi arrived in England in 1896 and was introduced to Sir William H. Preece, chief engineer of the General Post Office, at whose request he conducted experiments between the G.P.O., London, and a site on the Thames Embankment. These experiments were afterwards transferred to Salisbury Plain, and in May, 1897, to the Bristol Channel.

Sir William Preece was very interested in Marconi's experiments and detached from his own staff Mr. G. S. Kemp to assist Marconi. Mr. Kemp had previously assisted Sir William Preece with his " parallel wire " experiments in the Bristol Channel. Experiments both by Preece's " parallel wire " and Marconi's elevated aerial systems were conducted from Penarth between May 6th and May 29th, 1897, with the result that Preece was completely convinced that Marconi was working on an entirely new system with much greater promise than his own.

In the matter of precedence, it all depends on what is meant by " wireless." If by " wireless " is meant the transfer of intelligence through space by electro-magnetic energy without the use of material connection by any system, it can be claimed on Preece's behalf that he preceded Marconi, but no important system of communication has ever been established by that means, and in a lecture to the Royal Institution in June, 1897, on " Signalling through space without wires," in which, after expanding other and older systems including his own, Preece exhibited Marconi's, and referring to its capabilities, said: " Marconi has not discovered any new rays. Columbus did not invent the egg, but he showed how to make it stand on its end, and Marconi has produced a new system of telegraphy that will reach places hitherto inaccessible. Enough has been said to show that for shipping and lighthouse purposes it will be a great and valuable acquisition."

The interest about the Penarth experiments is that Penarth Downs was the scene of comparative tests between the " conduction " system of wireless communication and the Marconi system, and if any memorial were to be erected there it would seem appropriate that note should be taken of this fact. There are already memorials commemorating Marconi's early experiments at the Needles, Isle of Wight, and Poldhu, Cornwall.

Chelmsford. G. M. WRIGHT,
Engineer-in-Chief,
Marconi's Wireless Telegraph Co., Ltd.

Room Circuits

IN your issue of April 19th, Mr. R. H. Rawll suggests that the I.E.E. Wiring Regulations should be amended to permit room circuits consisting of an unlimited number of 15-A socket-outlets in one room to be fed from a 15-A fuseway via a 7/·029 in. cable in order to provide an adequate number of outlets at a minimum cost pending the availability of the new domestic fused plug and socket.

Although the necessity for some such move is indisputable, objection can be taken to it on two counts: First, the protection provided for small-current appliances and their associated flexibles is inadequate as the fuse rating will be many times their load; secondly, the cost could be still further reduced.

It is suggested as an alternative that a 15-A switched-socket outlet, connected to a final sub-circuit in the normal manner, should be provided in the one position in the room where a large fire would naturally be placed. Alongside this socket-outlet would be a single-pole 5-A fuse (or small circuit-breaker) connected to the live side of the incoming 7/.029 in. cable. From this fuse could be fed any number of 5-A sockets via a pair of 3/·029 in. cables. This would overcome the first objection by providing independent fusing of the smaller outlets of 5 A and by using 3/·029 in. cable instead of 7/·029 in. and 5-A sockets against 15-A.

The only disadvantage which the scheme

would seem to possess compared with Mr. Rawll's room circuit appears to be the lack of provision for moving a 2- or 3-kW fire about the room, a facility which, in the opinion of the writer, is likely to be missed by very few people and the omission of which would probably result in a greater freedom from the risk of fire.

A further point in connection with domestic installations is the unsuitability of the present conventional double-pole, wood-cased fuseboard. In view of the present shortage of ceramics for electrical purposes, and the fact that single-pole fusing is now obligatory in a great number of installations, it is to be hoped that manufacturers will turn their attention to single-pole fuseboards and switchgear for domestic installations, thereby saving 50 per cent of the precious porcelain and at the same time lessening the cost.

At the present this single-pole gear seems to be regarded as special and is viewed with suspicion by many authorities, but its large-scale production is an urgent necessity if we are to attempt to equip the many millions of homes needing adequate electrical facilities. A further improvement would be the fitting of an earth continuity bar on non-metallic case distribution boards. A simple fitting of this nature, formed as an integral part of the gear, would make a safe and tidy job of what is, at present, usually an unsightly makeshift.

*London, N.*8. B. RAYNOR,
John Trapp (Electrical), Ltd.

Instantaneous Water Heaters

REFERRING to "Reflector's" note on electric geysers in your issue of April 26th, I never understood why these most useful appliances were considered inimical to a good load factor. What is harmful to a good load factor is the wholesale connection of numbers of water storage heaters as a domestic load, which, of necessity, cut in together during the period of peak load. With instantaneous heaters, however there is a very high degree of probability that they must cut in before, or after, but not during, peak periods.

In 1936 I would not install electric water heaters in my otherwise all-electric house until I had found a suitable instantaneous water heater for the bathroom and was able to convert the borough electrical engineer to my arguments about superior diversity. We did make a "gentleman's agreement" that I would not use the heater during peak periods, which anyway occurred during dinner time!

From good experience I would say that an all-electric house is best served by a storage water heater in the kitchen and an instantaneous heater in the bathroom. Loading should be about 12 kW. Instantaneous heaters are cheaper, more robust, much safer and very much more compact than storage heaters.

I have never had any interest in the sale of water heaters.

Bromley, Kent. R. WHEATLEY MINTER.

Heat Pumps

I VERY much appreciated your articles on "Heat Pumps" in last week's *Electrical Review*. I am certain that there is a greater future in the use of this device, but I am not sure that they are an economic proposition in this country unless the overall efficiency can be raised.

Consider the case of Norwich City Hall. Here it is proposed to install a 500-kW motor to supply 1,500 kW of hot water flow—an "efficiency" of 300 per cent in itself. However, it is doubtful if the rotor will receive more than 25 per cent of the heat energy of the fuel burnt at the power station, so that the overall thermal efficiency will be 75 to 80 per cent. This is comparable with that obtainable in a coke-fired central-heating boiler, so that practically no actual saving in fuel will result.

I consider that a better chance of fuel saving would be possible if the device were applied to the waste heat present in power stations in built-up areas. Heat is available in condensers and transformer coolers at temperatures which require only a small boost to make them useful for space heating. Perhaps the "Electrolux" system might also provide better overall efficiency, as the excitation would then be thermal which involves less initial inefficiency than an electrically driven pump.

Surbiton. F. G. STEVENS.

Subdivisions of the Mho

KELVIN invented the word mho by inverting the word ohm and to-day the mho is used for theoretical purposes but has not come into use for everyday purposes. The reason is that while the ohm is a divisor by which we may deal with 2·4 amps by dividing 240 volts by 100 ohms, the mho is a multiplier and 240 volts with 100 mhos gives 24,000 amps, which is unworkable. Even with decimals the mho is inconvenient. We may overcome the difficulty by using sub-

divisions such as millimho for the thousandth part, and, using Kelvin's inversion method, gemmho for the millionth part of a mho, sometimes called the inverse megohm. Perhaps this word may be unacceptable and might better be termed micro-mho, which is more euphonious: 240 volts with one millimho would give 0·24 amps, while the micro-mho would deal with milliamps. Ultimately the term millimho will become as familiar as milliampere.

Tynemouth. C. TURNBULL.

Unearthed Conduit

WITH reference to the report in your issue of April 26th, "Child's Death in Garden," I note that the coroner stated that had it not been for the insulation of the cable wearing away at a bend of the pipe, the fatality would not have happened.

I suggest that had the pipework been properly earthed, the fatality could not have occurred, even if the live conductor had come into contact with the inside of the tubing, as this would have in all probability blown the fuse. P. A. SMITH,

*London, S.W.*1. *Managing Director,* Drake & Gorham, Ltd.

Radar Navigation

Additional Convention Meeting

AT an additional Radiolocation Convention (March, 1946) meeting in London last week of the Radio Section of the Institution of Electrical Engineers radar navigation and bombing aids to aircraft were discussed.

In his introductory paper, DR. R. A. SMITH (Telecommunications Research Establishment, M.A.P.) outlined the advances made during the war and the major role played by pulse technique, which turned radio from a navigational aid into a primary navigational system for night and bad-weather flying. Progress had been great, but there were still many outstanding navigational problems. Some of them might be solved by the more classical continuous-wave methods, which generally were simpler than radar, but there were not likely to be cheap solutions for many of the fundamental problems involved.

The two outstanding advantages of radar were that it measured distance precisely and also sorted out unwanted from wanted reflections. Those factors were so fundamental as to render it likely that radar would play as great a part in future as it had done during the war years.

Dr. Smith's paper outlined the main systems briefly; the various kinds of equipment were described in greater detail in subsequent papers. For instance "Gee," developed primarily to enable bombing aircraft to find their targets in Germany, was dealt with by MR. R. J. DIPPY. He described the basic principles of the system, which had been used by the Royal Air Force since 1942, together with technical details of general interest concerning airborne equipment. Technical refinement would simplify the operation of the system and render it substantially more economic for civil aviation.

DR. F. E. JONES described in detail the "Oboe" system of ground controlled blind bombing used by the Pathfinder Force of Bomber Command of the R.A.F. since 1942 and later by the U.S. IXth Air Force.

At present the system was being used to find out how the velocity of electromagnetic waves varied with height above ground. It might also be employed for accurately measuring winds and, by substituting an automatic camera for the bomb-release mechanism, photographic ground surveying could be done. The system had been operated automatically without the aircraft being aided by a human pilot.

MR. C. J. CARTER traced the development since 1939 of the airborne microwave device known as "H_2S" which provided within an aircraft a visual picture of the terrain beneath it. The basis of the system was the manner in which radar responses varied with the characteristics of the ground reflecting them, towns standing out especially well against the background of the "map."

The author outlined the way in which the equipment was used by Bomber Command of the R.A.F. and concluded by describing a complete outfit. The P.P.I. picture (plan-position indicator) was formed on the screen of a cathode-ray oscilloscope of the long afterglow type and development ultimately enabled dimensions on the picture to be related linearly to dimensions on the ground, so furnishing a true map of the terrain beneath the aircraft.

South African Railway Electrification

IN the 1944-45 report of the general manager of the South African Railways, just released for publication, it is stated that a large programme of electrification works, involving conversion to electric traction of 266 route miles, has been drawn up. The principal item is the electrification of the Bellville to Touws River section—a distance of 149 miles—to allow for electric haulage of trains between Cape Town and Touws River. This includes the difficult Hex River Mountain section.

The electric railway between Cape Town and Simonstown is being converted from 1,500 to 3,000 V operation. As it has been decided similarly to change the Cape Town to Bellville line and the Cape Flats line and also to use 3,000 V on the proposed main line electrification to Touws River, all the electrified railways in South Africa will in the near future be operating at this voltage. At the present time the cost of the alteration will be high, nearly £700,000, but this will be offset by an annual saving of £52,000 on the working costs in the augmented electric railway services planned.

I.E.E. Annual Report

Further Increase in Membership

AT the seventy-fourth annual general meeting of the Institution of Electrical Engineers the Council presented its report for 1945-46. During the twelve months ended March 31st the membership increased by 2,493 to 29,158 of whom 13,447 are corporate members, as compared with 14,884 and 7,804 fifteen years ago and 19,044 and 9,462 in 1938-39. An extension of period of membership in the student class has been granted to those whose war duties prevented preparation for the Institution's examination. Members of enemy nationality who supported the Allied cause may now be elected or reinstated. Physicists holding an honours degree in physics and having had four years' practical electrical engineering work (two in a responsible position) are to be eligible for associate membership at 28 instead of 30 years of age or (by passing the compulsory subject of Section B of the examination) at 26 years.

During the war 156 of the 4,463 members serving in the Forces and 26 in civil occupations lost their lives. Present arrangements regarding halving subscriptions for those in the Forces serving overseas and interned civilians will continue for 1946. The Secretary of State for the Colonies has invited the aid of the Council in recruiting personnel for the unified Colonial Engineering Service (which has in this respect superseded the various Crown Agents) who must be corporate members of the I.E.E. or hold qualifications granting exemption from Sections A and B of the examination. By an amended Engineers' Registration Act in New Zealand corporate members there automatically become eligible for registration.

Improved Attendance at Meetings

An appendix shows in diagrammatic form the general framework of the organization of the Institution. A further appendix lists 803 meetings of members, Council and committees. At the fifteen ordinary meetings in London the average attendance was 355 compared with 228 for the previous year. For the Sections the number of meetings, average attendances, and total membership were as follows : Installations, 8, 175, 2081; Measurements, 10, 118, 1319; Radio (excluding the Radiolocation Convention), 19, 210, 2950; Transmission, 8, 86, 1914. A liaison committee has been set up to promote closer co-operation between the Radio Section and the Institute of Radio Engineers (America), one result of which was the joint meeting by radio link held in January.

At the Radiolocation Convention in March, 63 papers and lectures were presented to audiences varying between 778 and 310 in number. The Transmission Section is to collate information on British practice in the design and construction of overhead lines for issue as a Code of Practice. Two further Students' Sections, in Northern Ireland and in the Southern Centre, are being formed which will bring the total to twelve.

Draft Codes of Practice have been drawn up for eleven subjects by the Committee convened by the Council under the chairmanship of Mr. P. V. Hunter. A sub-committee (Mr. C. A. Cameron Brown, chairman) is drafting a Code for electrical installations in farm buildings and another committee has in hand flameproof electrical equipment.

In response to a request from the Postmaster-General a new Committee on Electrical Interference with Broadcasting was set up to review the Report of the Committee of 1936 and has prepared an interim report which reaffirms the recommendations that legislative action for the control of interference is desirable and that the Electricity Commissioners should draw up and administer appropriate regulations.

Empire Conference

In co-operation with the Institutions of Civil and Mechanical Engineers an Empire Conference will take place in London from September 14th to 18th. A brief account is given in the report of the visit to Canada and New York of the President, as the representative of the three Institutions, in company with the secretary, during which Dr. Dunsheath spoke of " The Contributions of British Engineers to the Allied Cause."

In future the president will serve, *ex officio*, on the Electrical Industry Committee of the British Standards Institution, the director of which, Mr. P. Good, is a vice-president of the I.E.E. In addition Mr. J. R. Beard, a past-president, I.E.E., represents the founder institutions of the original Engineering Standards Committee on the General Council & Executive Committee of the B.S.I.

The Professional Engineers' Appointments Bureau has been operating for five months and has secured accommodation at 13, Victoria Street, S.W.1. By the end of 1945, the number of engineers registered was 924, of whom 301 were electrical.

The income of the Benevolent Fund increased from £6,641 to £7,819; grants aggregating £4,780 were made to 79 persons. For the Homes Fund £3,500 was subscribed by 530 members; an 8-acre site for a residential estate at Malden, Surrey, has been given by Mr. C. W. Speirs. At December 31st the capital of the Lord Hirst Fund stood at £11,543, which produced an annual income of £346; the balance to the credit of income account was £986.

The death is recorded of Mr. J. Corthesy, librarian for the past 33 years.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Lancashire Electric Power Co. has appointed **Mr. O. Howarth,** M.I.E.E., as sales manager and technical adviser to control all selling activities of the company, including h.v. contracts, installations, hire and hire-purchase, l.v. sales and development generally, while continuing his former responsibilities. In this capacity he will be directly responsible to the assistant manager and manager for policy and administrative control. Mr. Howarth has been chairman of the Measurements Section of the I.E.E., and chairman of the North-West Centre, and has served on the Council. He is a member of various B.S.I., E.R.A., and E.D.A. committees.

Other appointments are those of **Mr. W. D. Sutcliffe,** A.M.C.T., A.M.I.E.E., as superintendent of the Testing Department, **Mr. L. Loukes** as assistant to the sales manager to deal with technical matters, and **Mr. N. H. Bridge** as assistant to the sales manager to deal with the commercial side of the Sales Department in addition to publicity. Mr. Sutcliffe was on the staff of the Director of the Signal Division, Admiralty, for nearly four years; Mr. Loukes was formerly district engineer and manager for the company's Ormskirk and West Lancashire area; and Mr. Bridge has taken an active part in E.D.A. activities and serves on several of the Association's committees in the N.W. area.

Mr. D. F. S. Brass, B.Sc., A.M.I.E.E., has been appointed district mains engineer in the Portsmouth Electricity Department. Mr. Brass was educated at Inverness Royal Academy and Edinburgh University and served an apprenticeship with the General Electric Co., Ltd., at Witton. He then spent seven years in the mains departments of the S.W. & S. Electric Power Co. at Redditch and Kidderminster, later becoming a technical assistant in the Erection Department of the English Electric Co., Stafford.

Mr. D. F. S. Brass

Mr. G. A. Reynolds (Fulham) has been appointed mains superintendent in the Lincoln Electricity Department and **Mr. Laing** (London) temporary resident engineer.

Captain R. H. J. Wallis, who is in command of the cable ship *Monarch* described in this issue, has been in the Post Office service for twenty-six years. He commanded the previous *Monarch* and the *Ariel* and during the war had a distinguished record, having laid and maintained vital telephone cables in support of the advancing forces in Europe. Captain Wallis is also an artist and paints and sketches with some skill.

Mr. A. Smith has been appointed by Drake & Gorham, Ltd., to take charge of the southern area of their Agricultural and Horticultural Department with offices at 164, Friar Street, Reading. For many years Mr. Smith has been associated with Edmundsons and has held executive positions with the Wessex Electricity Co. in which he has specialized on electricity as applied to agriculture; he has published many articles on the subject.

Mr. A. Smith

To mark the occasion of his retirement after 44 years' service with Crompton Parkinson, Ltd., and formerly Crompton & Co., a farewell luncheon, presided over by Mr. T. H. Windibank, was given to **Mr. H. O. Burge,** who was for many years chief electrical designer. During the luncheon a cheque from his colleagues was presented to him by Mr. V. S. Cass. Mr. Burge is succeeded by **Mr. L. Greenwood.**

Mr. J. Eatock, A.M.I.E.E., chief technical assistant in the Preston Electricity Department, on the recommendation of the borough electrical engineer (Mr. G. A. Robertson) has been appointed deputy borough electrical engineer. **Mr. C. C. Bacon,** A.M.I.E.E., senior assistant, technical department, has been promoted to technical assistant.

Other promotions are: Mr. H. M. L. Coward from assistant station superintendent to generation engineer; Mr. W. L. Aspden from senior shift charge engineer to assistant station superintendent; Mr. A. Beckett from boiler house engineer to testing and operating engineer and Mr. H. Speight from boiler house engineer to assistant shift charge engineer. This reorganization of the station staff was consequent upon the retirement on April 23rd of **Mr. G. A. Madden,** chief assistant (generation), after ten years' service with the Corporation.

Mr. H. T. Collinswood has resigned from the board of the Harland Engineering Co., Ltd.

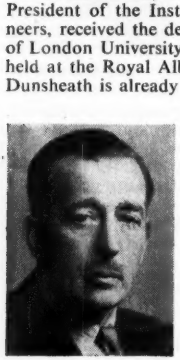
Mr. W. B. Parkinson, B.Sc., A.M.I.E.E., assistant engineer (distribution), Liverpool Electric Supply Department, is recommended for the position of assistant meter and test superintendent, and **Mr. C. C. Smith,** A.M.I.E.E., engineering assistant, for the post of deputy city

lighting engineer. The following promotions have been approved: **Mr. A. E. Sweeney,** A.M.I.E.E., district high-voltage inspector to be divisional h.v. engineer; **Mr. G. T. Brownson,** assistant station electrician, Lister Drive station, to be assistant electrical engineer; **Mr. W. J. Jakeman,** junior assistant maintenance engineer, to be engineering assistant (distribution).

Mr. G. Hodgkin has been appointed by W. T. Henley's Telegraph Works Co., Ltd., as engineering district representative for South-East England and the Greater London Area south of the Thames. **Mr. J. A. West,** who before joining the Forces was a representative at the company's Leeds branch, is being transferred to its Manchester branch.

Mr. R. N. Torpy, for over thirty-three years borough electrical engineer of Tunbridge Wells, retired last week. On behalf of the Council and the chief officials the Mayor presented Mr. Torpy with a gold wristlet watch.

Mrs. Dunsheath, wife of Dr. P. Dunsheath, President of the Institution of Electrical Engineers, received the degree of B.Sc. (Economics) of London University at a presentation meeting held at the Royal Albert Hall last week. Mrs. Dunsheath is already a Bachelor of Arts.



Mr. L. C. Gamage

At the fifteenth annual general meeting of the Radio Industries' Club on April 30th, **Mr. Leslie C. Gamage,** joint managing director and vice-chairman of the General Electric Co., Ltd., was elected president for 1946-47 in succession to Sir Robert Renwick.

Mr. H. Douglas, financial officer to the Electricity Commissioners since 1938 and a member of their staff since 1920, retired on May 6th. His services are being retained in a part-time advisory capacity. **Mr. F. A. Rawlings,** the present deputy financial officer, has been appointed financial officer.

Mr. W. L. Maclennan, B.Sc., A.M.I.E.E., senior control engineer, Central Electricity Board, has been recommended for the position of chief electrical engineer to the Glasgow Corporation Transport Department.

An interesting ceremony took place in the Concert Hall of the Telegraph Construction & Maintenance Co., Ltd., and Submarine Cables, Ltd., last Friday, when Mr. J. N. Dean, director, supported by Mr. W. F. Randall, director, and Mr. F. Leighton, works manager, presented wallets containing Treasury notes to Mr. W. G. Camp and Mr. H. W. Dyer as a token of appreciation of their long and loyal service. They have recently retired on pension, Mr. Camp after fifty-seven years' and Mr. Dyer after forty-seven years' continuous service with the company.

Sir Edward Appleton, F.R.S., secretary of the Department of Scientific and Industrial Research, and **Dr. John Haughton,** formerly principal scientific officer in the Metallurgy Division of the National Physical Laboratory, are leaving for Brussels this week-end to lecture under the auspices of the British Council at the sixtieth anniversary conference of the Societe Royale Belge des Ingenieurs.

Mr. H. Cecil Booth, F.C.G.I., M.Inst.C.E., chairman of the British Vacuum Cleaner & Engineering Co., Ltd., has recently had his portrait painted by Mr. David Jagger. The portrait is exhibited at the Royal Academy which opened last Saturday.

Mr. E. J. Hooper, A.M.I.E.E., has just retired from the position of Admiralty Regional Electrical Engineer, North Western Region. Mr. Hooper, who was born in Portsmouth, entered Admiralty service as an apprentice in 1898. In 1909 he went to Malta as one of the youngest inspectors of electrical fitters ever appointed. Afterwards he served in a variety of positions and went to Manchester in 1938. One task which fell to him during the war was to ensure sufficient supplies of copper to meet the requirements of degaussing. Mr. Hooper proposes to live at Worthing.

Obituary

Mr. A. J. Wray, M.I.E.E., died at Looe on April 30th. An Australian by birth, Mr. Wray came to this country about 1901, and took up an appointment with the British Electric Traction Co., Ltd., afterwards being appointed to the position of managing engineer of the Banbury & District Electric Supply Co., one of the Traction Company group. He retained this position until 1928 (with the exception of three years whilst he was in charge of the Kidderminster undertaking). On the absorption of the Banbury concern by the S.W. & S. Power Co., Mr. Wray was transferred to its head office at Mucklow Hill, Halesowen, where he remained until his retirement in 1935.

Mr. J. Gledson.—We regret to report the death on April 25th of Mr. James Gledson, governing director of J. Gledson & Co., Ltd., at the age of eighty-one. Mr. Gledson was very well known in the electrical industry on the North-East Coast. He was a past-president of the Electrical Wholesalers' Federation and for many years was hon. treasurer of the North-East Coast branch of the E.I.B.A.

Lady Watson.—We are sorry to learn of the death on May 4th of Lady Watson, wife of Sir Duncan Watson, member of the Central Electricity Board and director of several electric power companies.

PARLIAMENTARY NEWS

By Our Special Reporter

Mining Machinery

IN the House of Commons on April 30th, Mr. D. J. Williams asked the Minister of Fuel and Power how many mechanization training centres were now opened; how many people were attending these centres for training; and what steps were being taken to increase the number of such centres, in view of the urgent need for mechanizing the collieries.

Mr. Shinwell said that there was at present one Government training centre for mines mechanization, at Sheffield. So far this centre had proved capable of meeting the needs in relation to past and prospective mechanization schemes, but the question of its possible extension or duplication to meet future needs was being considered. The number of students who had been through the various courses offered since the centre was opened in November, 1943, was 2,001, and the number under training at the moment was 282.

Mr. Williams asked what steps were being taken to introduce trolley locomotives into British coal mines.

Mr. Shinwell replied that the use of trolley locomotives in British coal mines was prohibited under the Coal Mines Act, 1911, by No. 136 (a) of the General Regulations of July 10th, 1913. The Technical Advisory Committee recommended that this requirement should be modified so as to permit the use of trolley locomotives under favourable conditions in particular cases. A sub-committee had accordingly been engaged for some time past on the preparation of a detailed scheme, which he was informed would reach him very shortly.

Answering a further question Mr. Shinwell said he was sending Mr. Williams a list of collieries where power loading machinery was installed. Of a total of approximately 260 power loaders at work, 115 were of British manufacture. His Department, in collaboration with British manufacturers, had arranged a programme for the production of all the types of power loading machinery which, in the light of experience gained during the past few years, would be necessary to meet present and projected requirements. The further extension of power loading was being encouraged wherever suitable.

R.A.F. Electricians

On May 1st Mr. Callaghan asked the Under Secretary of State for Air if he was aware of the dissatisfaction among R.A.F. electricians because of the delay in their demobilization programme, in view of the fact that certain trades to which remustering took place were now ahead of electricians; what was the average length of postponement of release; and how soon he expected this trade to be level with the general releases.

Mr. Strachey said it was quite true that whereas at the beginning of the release programme last June they had a surplus of electricians, and actually remustered some of them to help, for instance, the clerks, they now had a deficiency, and that they were this month three groups behind—though this only meant from one to two months' delay in release. This was an instance of the successive speed-ups of release having upset our re-training programme. He could not yet give a date when they expected to get them level with the general rate again, but they were now hard at work training electricians.

Telecommunications Research

On May 3rd Mr. Burke, the Assistant Postmaster-General, replying to Mr. Cobb, said that much valuable telecommunications development had been done by the Dollis Hill staff, including ultra short-wave communication and co-axial cables. One of the most recent pioneer jobs there was the submerged repeater which would very likely revolutionize the whole of the world's communications. On the postal side the station was at present engaged on a scheme for the electro-mechanical facing of letters. A device had been brought into being which by using electro-mechanical means got the stamp on the envelope or postcard into exactly the right position for cancelling. It would do away with a great deal of labour in consequence. It was proposed to use the Dollis Hill premises to the full for research. The Post Office had just been successful, working in association with the Medical Council, in bringing out a hearing aid which, he hoped, would not fall into the hands of private people to be exploited. It would be of benefit to thousands of deaf people in this country.

Price of Transformers

On May 6th Mr. Weitzman asked the Minister of Supply whether he was aware that five contractors were recently invited by the Stoke Newington Borough Council to tender to a set specification for the supply of three 500-kVA transformers; that when the tenders were opened, four were found to be of the same amount, and that, before the Council could accept the tender of the fifth contractor, which was for a lower amount, the original offer was withdrawn and a fresh offer substituted which was exactly the same as that of the other four contractors; and, in view of this clear evidence of a price ring, whether he was prepared to investigate the matter and take the necessary appropriate action.

Mr. Wilmot said that if the Council had reason to think the price quoted was unreasonable he would certainly investigate the matter.

Electric Steam Raising

Economical Operation of Electrode Boilers

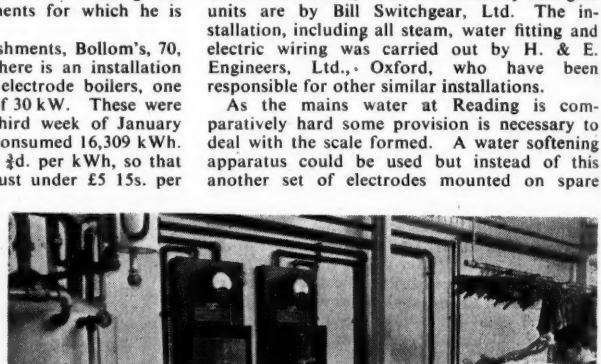
WITH electricity at not more than 1d. per kWh and for quantities of steam up to 1,000 lb per hr evaporation, electrode boilers are proving to be the most economical, not to mention clean and convenient, way of providing steam for dyeing and cleaning purposes. This is the experience of Mr. L. E. Cleathero, director of Belsyre Cleaners, Ltd., Oxford, who has adopted this method of steam raising for several of the establishments for which he is responsible.

At one of these establishments, Bollom's, 70, Oxford Road, Reading, there is an installation of two Bastian & Allen electrode boilers, one of 70 kW and the other of 30 kW. These were put into service in the third week of January and by March 22nd had consumed 16,309 kWh. The rate charged there is ¾d. per kWh, so that the total cost has been just under £5 15s. per week to supply all the steam requirements (about 300 lb per hr maximum). Having estimated the cost at £7 10s. per week, Mr. Cleathero is very satisfied with the results which, taking into consideration the elimination of stoking and maintenance, are considerably cheaper than would be possible by utilizing gas, oil, or coke.

In addition to its absolute cleanliness obviously a most desirable feature in itself for cleaning work) the plant is extremely compact as compared with other types of steam raising apparatus. Actually the whole equipment occupies a floor area of about 18 sq ft, the boilers themselves measuring only 5 ft. 1 in. high by 14 in. dia., and 3 ft. 6 in. high by 13 in. dia. respectively. Other types of boiler giving the same steam output measure, say, 8 ft high by 3 ft. 6 in. dia. apart from the fuel storage space. A further advantage is the constant steam pressure obtained and very quick starting up, the full steam pressure being available in the boiler within about five minutes after switching on from cold.

The 70-kW apparatus, which operates at 70 lb pressure serves a dry cleaning machine, a drying cupboard and a spirit distillation plant. For operating two presses the 30-kW unit works at 45 lb per sq. in. In both cases pressure is controlled by means of devices incorporated in the boilers and is maintained by means of water feed pumps driven by ½-H.P. motors (B.T.H. Co.) running at 1,425 r.p.m. The boilers are protected by Erskine Heap oil circuit-breakers and the pumps have Crabtree automatic starters, while the necessary fuse gear units are by Bill Switchgear, Ltd. The installation, including all steam, water fitting and electric wiring was carried out by H. & E. Engineers, Ltd., Oxford, who have been responsible for other similar installations.

As the mains water at Reading is comparatively hard some provision is necessary to deal with the scale formed. A water softening apparatus could be used but instead of this another set of electrodes mounted on spare top cover plates for the boilers have been supplied and are readily interchangeable. This is said to have paid for itself already.



Electrode steam boilers used for cleaning purposes at Bollom's premises, Reading

Reports on German Industry

Among the latest reports of industrial investigators who have inspected German industry under the auspices of the British and Combined Intelligence Objectives Sub-Committees are BIOS.213 "Siemens-Halske Werke, Erlangen—Electrical Measuring Instruments" (6d.) and BIOS.248 "The Radio Valve and Lamp Industry in Vienna" (2s.). A limited number of copies are available from the Stationery Office.

Bushing Insulators

Review of Surface Discharge Phenomena

By E. G. Wright,
Graduate I.E.E., A.M.C.T.

A GENERAL solution for the electrical characteristics of bushing insulators is not at present possible because of the complex laws of electrical breakdown and discharge phenomena of dielectrics and the mathematical difficulties of solving the Laplace equation for a three-dimensional electric field having the boundary conditions met with for practical bushings.

The radial electric field strength between the conductor and earth flange is usually calculated by the formula for infinite coaxial cylinders,[1] although this formula does not give the correct values for the field strength in the dielectric near the ends of the flange and its use is not justified if the flange length is small. These cases can, however, often be approximated by applying the formulæ for coaxial and confocal hyperboloids.[2] By the use of such formulæ, together with empirical information on the electric strength of the dielectric material employed, the puncture voltage and, in the case of air- or fluid-filled bushings, the internal discharge voltage, can be estimated. Similar simple expressions for the axial field strength along the bushing surface, which is important for the surface discharge and spark-over voltage, are unfortunately not available, and these values have to be largely based on empirical formulæ and experience. Several methods have been proposed to estimate these characteristics or at least obtain some general principles of design[3-8], but only that dealing with the calculation of the surface discharge voltage and spark-over voltage based on the laws of the gliding discharge and the conception of surface capacitance will be dealt with here. This method, developed from a study of the laws and mechanism of the discharge phenomena, enables a number of general design principles to be derived and also permits the calculation of the electrical performance for certain arrangements.

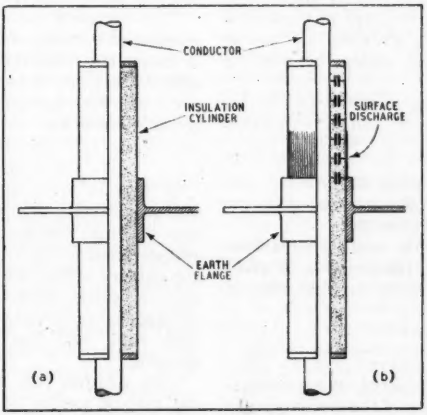


Fig. 1.—(a) Simple cylindrical bushing, (b) schematic diagram of surface discharge and elemental capacitance

Surface Discharges in Air

If the voltage applied to a simple bushing such as shown in Fig. 1a is increased sufficiently, while the bushing is observed in the dark, the edge of the earth flange begins to glow with a number of fine corona points. This occurs when the local electric field strength at the edge of the flange exceeds the electric strength of air. As the voltage is increased this glow becomes more pronounced and surface discharges in the form of faintly luminous threads appear. This occurs for both positive and negative polarity of the flange but the negative discharge is shorter than the positive and also more compact and regular in appearance. For A.C. a combination of both these discharges is seen as a fringe of streamers consisting of numerous fine parallel threads, and the length of this fringe increases linearly with the applied voltage up to a certain critical voltage when the character of the discharge changes.

These streamer discharges, which are conducting paths of high resistance, progressively charge the adjacent elements of the dielectric surface, the charging current i being given by the usual formula:— $i = c\,dV/dt$, where dV/dt is the rate of voltage rise and c is the appropriate capacitance consisting of elemental surface capacitances indicated schematically in Fig. 1b. When the current

in a discharge thread reaches a certain critical value the discharge becomes a low resistance path, and gliding sparks occur. These are brilliant blue-white transient sparks which glide out of the main body of the discharge accompanied by a crackling sound. Such sparks increase in length very rapidly as the voltage is increased so that complete spark-over can occur at voltages little above the critical voltage at which they start.

The length l_t (cm) of the fringe discharge streamers up to the critical voltage, according to Haefely[5] who first investigated this type of discharge on bushings, is given by the following empirical law: $l_t = (V - V_o)/K$, where V is the applied r.m.s. voltage in kV, K represents the increase in voltage necessary to lengthen the streamers by 1 cm and is mainly dependent upon the permittivity κ of the dielectric and V_o is the voltage where the experimentally obtained streamer length-applied voltage curve cuts the voltage axis. This however is not the corona discharge starting voltage, which is usually higher, but is equal to the voltage required to produce a field strength $\mathcal{E}_o$ of 11 kV r.m.s. per cm in a hypothetical air film under the bushing flange.

For a simple bushing as shown in Fig. 1a, consisting of an earth flange, insulation cylinder and conductor: $V_o = \frac{\mathcal{E}_o}{\kappa} r_o \log_h r_o/r_i$, where r_o = outside radius of cylinder, cm, r_i = inside radius of cylinder, cm, and κ = relative permittivity of dielectric.

The constant K for the positive streamers, which are longer than the negative, is given in the accompanying table for materials of different permittivities.

TABLE

Permittivity κ	1	2	3	4	6	8	10
Constant K	15	10	7·7	6·5	5·05	5·0	5·0

This law can be considered an approximation only, and the length of the discharge also depends upon the power factor and thickness of the dielectric.[9]

From Toepler's[10] results the critical voltage V_o at which the glide sparks start, for a point-plane electrode arrangement separated by a flat insulation plate t (cm) thick, can be represented by $V_o = K'/\sqrt{c_1}$, where K′ is a constant and c_1 is the elemental surface capacitance (F/cm²) adjacent to the electrode given by $c_1 = \kappa_o \kappa/t$, and κ_o is the permittivity of vacuum ($0{\cdot}0886 \times 10^{-12}$ F/cm). The critical voltage is approximately the same for both positive and negative discharges.

A slightly different law, which agrees well with his test results on simple cylindrical bushings, is given by Roth[11] and this can be written as follows with c in $\mu\mu$ F/cm² $V_o = 25{\cdot}8/c^{0{\cdot}44}$, where V_o is in kV r.m.s. and c for the arrangement in Fig. 1 is given by $c = \frac{\kappa}{r_o \log_h r_o/r_i} \times 0{\cdot}0886$ $\mu\mu$F/cm².

According to Roth, the equation $V_o = 25{\cdot}8/c^{0{\cdot}44}$ is accurate for values of c greater than 0·25 $\mu\mu$F/cm² and is only approximate for smaller values, but it has been shown[9] that the critical voltage is also dependent upon the power factor of the dielectric and the humidity.

The length l_g (cm) of the glide sparks is, for the flat plates used by Toepler[10], $l_g \simeq k c_1^2 V_p^{5\cdot4} \sqrt{(dV/dt)}$, where V_p is the peak value of the applied voltage in kV, c_1 is the surface capacitance of the plate arrangement in F/cm², dV/dt is the rate of voltage rise in kV/μ sec and k is an empirical constant which is different for the positive and negative discharge, the difference becoming smaller as the rate of voltage rise increases.

This equation can be applied to simple cylindrical bushings if the surface capacitance is calculated from the appropriate formulæ and if l_g is equal to total length l of bushing the spark-over voltage V_s (kV peak) is given approximately by

$$V_s = \sqrt[5]{\left(\frac{l}{kc^2}\right)} \frac{1}{\sqrt[20]{(dV/dt)}}$$

It follows from this equation that the spark-over voltage is proportional to the 5th root of the bushing length and inversely proportional to the 2·5th root of the surface capacitance. The rate of rise of voltage has only a small influence on the spark-over voltage, as it is only dependent upon the 20th root, and can therefore usually be ignored.

This relation can be rewritten, ignoring the rate of rise of voltage and substituting the expression for c, to give the average spark-over field strength in kV/cm as follows:

$$\frac{V_s}{l} = k' \sqrt[2\cdot5]{\left(\frac{r_o \log_h r_o/r_i}{\kappa l^2}\right)}$$

From tests on plain porcelain bushings, Elsner and Rebhan[7] give the following values for the constant $k'' = k'/(\sqrt[2\cdot5]{\kappa})$:— 32·5 for an alternating voltage of 50 cycles per sec, 36 for positive 0·5/50 μ sec impulse wave (minimum impulse voltage) and 44 for negative 0·5/50 μ sec impulse wave (minimum impulse voltage).

The same authorities also mention that tests on bushings made with other dielectric

materials followed the preceding equation for $\frac{V_s}{l}$, except that the value of the constant was different.

The equations given for V_s and $\frac{V_s}{l}$ are not valid for very short bushings where spark-over occurs at a voltage below that required to initiate the glide sparks. The spark-over voltage and spark-over field strength in this case is similar to that of a plain support insulator.

These laws largely ignore a number of factors such as humidity, the conductivity of the solid dielectric and the dielectric surface film, the capacitance of the surface of the bushing to the earth flange and other capacitances in parallel with the bushing. Parallel capacitance can in some cases considerably reduce the spark-over voltage although the critical voltage V_c is not influenced. The length of the glide spark is also affected by the current available from the supply and intermittent sparks of shorter length are obtained if the supply has a limited current capacity. For simple cylindrical bushings in air, constructed with dielectrics of the type used for the purpose of investigating the above laws, the omission of these factors, except in so far as they are included in the constant of the equation for the particular test arrangement, may not be very serious.

If the edge of the earth flange is rounded, corona and fringe discharges are suppressed and glide sparks appear suddenly. Ribs or sheds on the insulator surface restrict the glide sparks and increase the spark-over voltage but discharges can occur between the ribs where there is a high surface field strength. It might also be mentioned that the glide sparks are very little affected by using the bushings in compressed air.[11 12]

For a steady d.c. voltage the voltage distribution on a bushing is governed by the volume and surface resistance of the dielectric material and space charges, and fringe and gliding discharges from the flange do not occur. Corona and streamer discharges start from the top of the bushing and spark-over develops suddenly in a manner similar to that of support insulators.

In practice, bushings should be designed so that there is no corona or surface discharge whatever at the working voltage, since such discharges eventually damage all organic and many inorganic materials with which the corona comes into contact.[9 13 14] While some glow discharge is permissible at test voltage the voltage should be below the critical voltage at which the glide sparks start.

Surface Discharges in Oil

Discharges under oil are generally similar to those occurring in air, but fringe discharges are not so obvious and with increasing voltage they quickly take the form of streamers or tree-like discharges concentrated at a few points on the earth flange. These discharges develop more suddenly than those in air and are less steady. In oil they quickly erode even porcelain and are considerably more dangerous than in air. Their appearance and effect has been described[9–15], but an investigation of their laws appears to have been reported only by Staack[16] for flat plates and Imhof[17] for plain cylindrical bushings.

The latter paper gives results of tests on porcelain, synthetic resin and impregnated-paper cylindrical bushings and also on bushings consisting of a thin walled hollow cylinder filled with compound, air or various oils. These bushings were immersed in a glass tank of clean oil ($\kappa = 2{\cdot}2$) and the commencement of glow discharges observed. Some test results are also given for the length of the discharge as a function of the applied voltage, wall thickness and permittivity, but the results do not enable a general equation for the spark-over voltage of cylindrical bushings to be derived.

The glow discharge voltage values are given as a function of the dielectric material thickness and permittivity leading to a formula of the type $V_g = Kt + 5$, where V_g is the glow-discharge voltage in kV (r.m.s.), t is the radial thickness of dielectric in cm and K is a function of the permittivity of the material. The constant K decreases from 25 to 12 as the permittivity increases from 4 to 6.

An analysis of these test results, which unfortunately cannot be complete due to the absence of certain data, shows that the glow discharge voltage V_g (kV r.m.s.) can be approximately represented as a function of the surface capacitance c ($\mu\mu$ F per cm^2) by the following equation: $V_g = 11{\cdot}5/\sqrt{c}$.

This formula is of similar form to the equation for V_c for discharges in air and makes the results more generally applicable as well as being more in accordance with the physical conditions.

The results for the tests where the hollow

cylinder was filled with an aniline oil having a high permittivity and conductivity and when filled with air do not agree with this law. This is however not surprising as the high conductivity of this oil could be expected to influence the results and for the air-filled tube the external elemental capacitances have a greater influence on the voltage distribution due to the permittivity of the surrounding medium being higher than that of the bushing dielectric.

In the same way as for bushings in air, ribs or sheds on the bushing increase the spark-over voltage, and the length of the discharge also depends upon the shape of the earth flange.

Application of the Formulæ

The formulæ given in this paper summarize the existing information but have only a somewhat restricted application as they are based on test results, in general, using thin-walled smooth cylindrical bushings having only one dielectric. Also a complete range of formulæ for the calculation of corona, glide sparks and spark-over voltage for both air and oil immersion are not given in the published literature. The information available however enables some general principles to be deduced even though numerical values can only be estimated for certain types of simple bushings.

A more complete investigation into the influence of factors such as the dielectric material for single dielectrics and dielectrics in series, the shape of the earth flange and the humidity, in the range of practical application should enable simple approximate formula for discharge and spark-over voltage to be established, and this would appear to offer an interesting field for further investigation.

The author acknowledges the assistance of Mr. S. Deutscher when studying certain publications on this subject.

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Radio Interference Suppression

NOW that post-war designs of domestic electrical equipment are being developed, manufacturers may care to be reminded that the tolerable limits of interference are laid down in BS. 800 and the method of measuring the interference is prescribed in BS. 727. At the present time there is a dearth of measuring equipment complying with BS. 727; there is, however, a certain type of radio receiver (known as the R. 206) which was developed for military use, but can be adapted to this purpose, and a small number of them are now surplus to Service requirements. The General Post Office is seeking to acquire these surplus instruments and make them available as cheaply as possible to manufacturers of electrical equipment. The cost cannot yet be stated, but prospective purchasers will be informed as soon as it is known.

Since only a limited number of instruments will be available, it is probable that the demand will exceed the supply. The British Standards Institution has therefore been invited by the Post Office to advise as to their most useful allocation. All inquiries should therefore be addressed to the Director, B.S.I., 28, Victoria Street, London, S.W.1, quoting the reference OC/1/3.

In advising on allocation the B.S.I. will take into account (*a*) the competence and willingness of the applicant to act, within reasonable and practicable limits, as an "approved testing station" for samples of the products of other manufacturers as well as of his own; and (*b*) the importance, from the radio interference point of view, of the range of products to be tested, particularly the applicant's own products.

COMMERCE and INDUSTRY

Advance in Cooker Prices. Research Tax Allowances.

Cooker Prices Increased

OWING to further increases in the costs of manufacture a number of the leading makers have given notice that prices of electric cookers dispatched on and after Monday next, May 13th, will be subject to advance, details of which may be obtained from the individual companies. The manufacturers concerned are Belling & Co., Ltd., British National Electrics, Ltd., Carron Company, Elexcel, Ltd., English Electric Co., Ltd., Falkirk Iron Co., Ltd., Falk, Stadelmann & Co., Ltd., General Electric Co., Ltd., Hotpoint Electric Appliance Co., Ltd., Jackson Electric Stove Co., Ltd., Revo Electric Co., Ltd., and Simplex Electric Co., Ltd.

New Electrical Factories

Following the £200,000 plan of Tube Investments, Ltd., for re-equipping the Simplex-Creda works at Oldbury, Birmingham, now nearing completion, it is announced that the recently acquired wartime aircraft factory at Blythe Bridge, Staffordshire, will be taken over on July 1st, and will be in production within the next few months. Ultimately to employ over 2,000, these works will first concentrate on the line production of cookers, wash-boilers, storage water-heaters and immersion heaters, for home and export, but a range of entirely new domestic electrical appliances is being developed for later manufacture there.

The first Government-built factory in the West of Scotland under the "distribution of industry" scheme was opened at Cambuslang, Lanarkshire, by Sir Steven Bilsland, M.C., vice-chairman of the Scottish Council of Industry, recently. It has been leased to Hoover, Ltd., and will be used to produce fractional-H.P. motors. The factory will absorb most of the labour used by the company during the war at its Rutherglen factory to make the wiring systems used in bombers, and many hundreds more from the adjacent areas.

Research and Income Tax

Some explanatory notes (No. 470) have been issued by the Board of Inland Revenue on income tax allowances in respect of scientific research. Hitherto money spent on research and payments to research associations, etc., were allowable as deductions in computing profits for income tax only if they were laid out exclusively for the purposes of trade and were not of a capital nature. Capital assets used for research qualified only to the same extent as similar assets used for ordinary trading purposes, e.g., if they ranked for wear and tear allowances as machinery or plant, or for depreciation allowances as being buildings of mill or factory type.

As from April 6th, 1946, Part iv of the Finance Act, 1944, authorizes a new system of allowances for capital expenditure on scientific research undertaken in connection with trade; this provides, in general for the expenditure to be allowed for income tax purposes over a period of five years. It also authorizes the deduction, in computing profits for income tax purposes, of certain payments made by traders to approved research associations, universities, colleges, research institutes and similar institutions for the purpose of research related to the trade even though the payments are of a capital nature. The term "scientific research" is defined and the method of applying the allowances is shown by means of examples.

Special Transformer Production

In 1941 W. Bryan Savage, Ltd., opened a dispersal factory in Northgate Street, Devizes, for the transformer manufacturing side of its business. Last year Mr. W. B. Savage and his wife, co-directors, disposed of their interests in the original company, and registered a new company, Savage Transformers, Ltd., to concentrate their activities at the Devizes factory. Here are

Special speech transformer in course of manufacture at the Savage transformer works

now made special transformers of all types for capacities up to 5 kVA and pressures up to 5 kV. Practically every unit made has some special feature. Among the many purposes for which apparatus is made are sound recording, telegraph and telephones, cinema work, rediffusion, welding, traffic lights, etc. The typical unit shown in the picture in course of construction is a special 300-W speech transformer having a response of ± 1 decibel over a range from 50 to 9,000 cycles. It has eight primary and six secondary sections balanced in two equal halves, interleaved and crossing over from one to the other. A copper foil screen is provided between primary and secondary to prevent leakage reactance. Fluorescent lighting chokes are a recent development, a design having been produced which enables a single unit to be suitable for any of the normal mains voltages.

Shipyard Electricians' Strike

Electricians in four ship repair yards in the Port of London and at Tilbury stopped work last week as the result of the standing-off of fifteen men at one of the yards while, the men alleged, women "dilutees" were retained.

According to a member of the central strike committee 95 per cent of the electricians engaged in ship repair work were on strike on May 1st. He said that the women dilutees had been discharged but the strikers wanted all the men who had been discharged as redundant to be allowed to return. If the employers then wished to discharge them notice should be given in accordance with the Essential Work Order. A settlement was reached and work was resumed on Monday.

Improvement of Turkish Communications

The establishment of radio, telephone and telegraph installations at Ankara and Istanbul to improve Turkish communications is being discussed between British and American firms and the Director of Turkish Postal and Communication Services. A proposed new radio and television station will cost £5,000,000.

Export Licensing Branch

The official address of the Export Licensing Branch (Board of Trade), is now Stafford House, 14–20, King William Street, London, E.C.4 (Mansion House 4555).

Wild-Barfield in Belgium

The Société Anonyme Wild-Barfield has been formed in Brussels under the control of Wild-Barfield Electric Furnaces, Ltd., to handle the sales and service of the company's furnaces in Belgium, Holland and Luxembourg, and to represent the associated company, G.W.B. Electric Furnaces, Ltd., in the same territory. Engineers trained in the design, construction and application of Wild-Barfield and Gibbons-Wild-Barfield furnaces are on the staff of S. A. Wild-Barfield to deal with all technical matters. The full resources of the present company's research and development departments will be available to the new company. The Belgium concern will also handle "Eternite" casehardening compound, as well as other equipment for hardening shops, metallurgical laboratories, etc. The new company's address is 165, Rue Belliard, Brussels.

Manufacture in Australia

The *Merchandiser* (Sydney) reports that Electricity Meter & Allied Industries, Ltd., is taking over a munitions factory at Orange, N.S.W., where refrigerators, washing machines and electric motors are to be manufactured.

New B.T.H. Offices in Buenos Aires

The British Thomson-Houston Co., Ltd., has opened offices at Avenida Pte. R. Saenz Peña 636, Buenos Aires. These offices are in charge of Mr. J. G. Boddy and will be the centre of the B.T.H. sales organization in southern South America. They are contiguous to those recently opened in the same city by the Metropolitan-Vickers Electrical Export Co., Ltd., thereby facilitating co-ordination and co-operation between these two subsidiaries of Associated Electrical Industries, Ltd.

Marketing Radar Equipment

The Metropolitan-Vickers Electrical Co., Ltd., and Siemens Brothers & Co., Ltd., announce that an agreement has been concluded between them in connection with the marketing, hire maintenance and servicing of radar and associated audio-type equipment for marine navigational purposes. The marine radar equipment which has been designed by Metrovick to the recently issued Government performance specification will continue to be manufactured by that company, while the design and manufacture of equipment on the audio side will remain with Siemens Bros. Marketing of both types of equipment on an outright sale basis will be done by both companies, whilst Siemens Bros. will handle hire maintenance and servicing contracts.

Hire-Purchase Traders

Speaking at the annual meeting of the Hire Purchase Traders' Association on May 1st, the chairman, Mr. R. B. Hurton, said that there had been only a small fall in membership during the war, although the Association's work had been severely restricted. He contested the idea held in some quarters that hire-purchase was inflationary and said that in the coming period of rehabilitation hire-purchase was bound to play a large and important part.

Mechanical Coal Winning

The Rhymney Engineering Co., Ltd., has been formed to develop and market the latest mechanical processes for winning coal. It will be jointly owned by Powell Duffryn, Ltd., and International Combustion, Ltd. The first directors are Mr. Edmund Hann (chairman), Sir George Usher (deputy chairman), Mr. F. G. Penny and Mr. Ivor Williams. The company intends to exploit the latest processes developed in Great Britain, the United States, Germany and Holland, and will take over from International Combustion, Ltd., the business which it has developed with such success in skip winding and other economical coal handling devices. The works formerly operated by Powell Duffryn on the site of the old Rhymney Iron Works have been acquired from the Ministry of Supply and will be equipped and extended to handle the already considerable amount of business which the new company is taking over from International Combustion, Ltd.

Fatalities

Killed While Watering Garden.—Christopher Edward Short (38), of Cockfosters, received a fatal electric shock while using a motor water pump in his garden. The hose became disconnected and, as he was trying to replace it, water poured over the motor.

Stage Hand's Death.—Percy Tressiter (46), a stage hand at Wimbledon Theatre, was killed when he touched a frayed electric wire while he was fixing the stage curtains.

Southampton Jubilee Exhibition

To mark the jubilee of the Southampton Corporation Electricity Department (reference to which was made in our last issue) an exhibition was opened at the Civic Centre on April 27th by the Minister of Fuel and Power (Mr. E. Shinwell). The exhibition, which closes tomorrow (Saturday) includes displays showing the evolution of modern labour-saving methods. Next to a model all-electric kitchen, for example, are five humorous scenes depicting cooking

through the ages from the time of the cave man. Illustrating progress in lighting, there is a section "From Flint to Fluorescent," while "black" floodlighting of a London scene shows the possibilities of ultra-violet rays. Among other exhibits are a scale model of a Babcock & Wilcox water-tube boiler, a copy of an original Parsons generator, a model of the C.E.B. substation at Nursling, and a "hole in the road" showing a joint in a 6,600-V cable.

London "Underground" Extension

Work began last week on laying rails along the western extension of the Central London Underground Railway Line between North Acton and Denham. The extension is part of the London Passenger Transport Board's pre-war scheme for providing through trains between Denham and Ongar. Preliminary work was resumed in February.

L.S.E. Handbook

To help its employees to take full advantage of the facilities offered by the company, Laurence, Scott & Electromotors, Ltd., has published an illustrated brochure. The apprenticeship scheme, benevolent fund, health services, pension scheme, and social activities, are among the subjects covered.

Story of the Pathfinders

In its issues of May 2nd and 9th *Flight* reveals the inside story of the Pathfinder Force, with many hitherto unpublished details of the ingenious equipment and methods which eventually gave the Pathfinders their deadly accuracy. The author of the articles is Wing Commander Maurice A. Smith, D.F.C., and there are many illustrations in full colour.

Railway Plan for London

A thirty-three plan costing £230,000,000 for the reorganization and development of the London suburban railway system is recommended in the report of the Railway (London Plan) Committee to the Minister of Transport (Stationery Office, price 2s. 6d.). It is proposed that all Southern Railway suburban services terminating at London Bridge, Charing Cross, Cannon Street and Holborn Viaduct should be put underground by the building of deep-level tunnels. The new lines would provide high-speed through services between the suburbs south of the Thames and the suburban lines of the other main line companies north of the river, giving access *en route* to many parts of the West End. Other cross-London lines would bring the total length of new lines in tunnels to over 100 route miles.

The scheme involves the provision of five double-track lines to carry services now passing through or terminating at London Bridge station, which would be re-sited at Tower Bridge Road, half a mile south-east of its existing site; a north-south tunnel to do away with the viaduct between Loughborough Junction and Holborn Viaduct; a new underground railway for freight through Blackfriars to Farringdon Street; a new terminal station on the site of the existing Waterloo Junction; the elimination of the railway bridges between Westminster and London bridges and the ultimate disappearance of Charing Cross, Cannon Street, Holborn Viaduct and Blackfriars stations; a new line from East Croydon in tunnel from Norbury, via Streatham, Brixton, Victoria, Euston, King's Cross and Finsbury Park; a new line in tunnel from Raynes Park via Wimbledon, Clapham Junction, Westminster, Charing Cross, Holborn, Liverpool Street, Dalston and Clapton; and new deep-level tubes to relieve the Northern Line.

Vactric Factory in Australia

The opening of a factory in Adelaide has been announced by Mr. W. C. Pegley, chairman and managing director of Vactric, Ltd., on his return from a world sales tour. The Australian plant is owned by a new associated company known as Vactric Electrical Appliances, Ltd., and it is hoped to achieve an output of 50,000 vacuum cleaners for the Australian market during the first year. The factory space is initially 60,000 sq ft, but it is expected that this will be doubled during the first year. A number of British technicians and experts will be sent to Adelaide. The new company has a nominal capital of £300,000, the majority of it Australian.

Wholesalers' Annual Meeting

The annual meeting of the Electrical Wholesalers' Federation is to be held at the Connaught Rooms, London, W.C.2, at 10 a.m. on May 23rd.

Model Engineer Exhibition

The twenty-first exhibition organized by *The Model Engineer* will be held in the New Hall of the Royal Horticultural Society, London, S.W.1, from August 22nd to 31st.

Trade Announcements

The Birmingham office of the British Thomson-Houston Co., Ltd., is now at 8, John Bright Street, Birmingham, 5.

Clayton, Lewis & Miller, Ltd., have moved from Staines, Middlesex, to their new Clem Works, Manilla Road, Southend-on-Sea.

Piggott & Whitfield, 214, Wellington Road South, Stockport, have taken over the contracting business of McClure & Whitfield.

Mr. G. T. Lewis has left London to take charge of the Maidstone branch of Superlamp, Ltd. The present branch manager at Maidstone, Mr. Moffat, is to re-open the company's Worthing branch on June 3rd.

INFORMATION DEPARTMENT

GENERAL inquiries from readers relating to sources of electrical goods, makers addresses, etc., are replied to by our Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Our extensive records enable us to reply to most inquiries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Fisher" water heater.

"Appleby" fire.

B.E.A.M.A. Annual Meeting

Serious Shortage of Skilled Labour

THE thirty-fifth annual general meeting of the British Electrical & Allied Manufacturers' Association was held at the Connaught Rooms, W.C.2, on April 25th, MR. E. C. HOLROYDE, chairman of the Council, presiding.

In presenting the report (*Electrical Review*, April 19th), the chairman said that during the war the industry had been called upon to extend to a degree never before contemplated and to manufacture equipment and apparatus of great variety and in vast quantities. It had acquitted itself with honour and was now immersed in all the problems connected with the change-over to peacetime production. Good work was being done, but the progress was not as rapid as was anticipated, due largely to the shortage of skilled labour—draughtsmen and technically-trained engineers—and to the slackening of the will to work.

The greatest needs were for the return of skilled men to industry, the cessation of the call-up of the younger trained workers and technicians, and the removal of the many reasons for the present lack of incentive to work. Until full-scale production had been re-established, it would be futile to talk of the absolute necessity for large increases in our exports. The demands from overseas were, for many products, far in excess of the present ability to fulfil within a reasonable time, and manufacturers were having to disappoint their friends abroad by extending deliveries and turning away many further orders. Unless this position was rectified soon, foreign competitors would become established in markets which had previously been mainly British and manufacturers would have great difficulty in recovering them later.

The Council had made representations to the appropriate Ministries on these matters, including the vital necessity for an immediate improvement in the skilled labour supply for the heavy electrical plant industry, which was fundamental to all development, and it was hopeful of the outcome.

There was much talk about nationalization, and those responsible for private enterprise were being disturbed in their thoughts at a most critical time. Given the opportunity without undue interference, he felt sure the electrical industry would overcome the difficulties with which it was faced and once again contribute largely to the prosperity of the nation.

MR. J. O. KNOWLES (Brookhirst Switchgear, Ltd.) expressed his appreciation of the work of the Technical Committees of the B.E.A.M.A. and also of what the Association had done on the selling side, particularly on matters of general policy. He appealed to all managing directors and works directors in particular to take every opportunity, in public and otherwise, of emphasizing the importance in the post-war world of the electrical manufacturing industry, and of regarding the B.E.A.M.A. not as the indefinite "they" who ought to do something about it, but as "we," as the common voice for the industry.

MR. E. COATES (Watford Electric & Manufacturing Co., Ltd.), asked if consideration could be given to the possibility of electing the Council from groups of members in such a way as to ensure a fuller representation of the smaller firms. The chairman said that this matter had been discussed by the Council and he indicated it would receive further consideration.

The following companies were elected members of the Council for the year 1946-47: Allen West & Co., Ltd., Berry's Electric, Ltd., Crompton Parkinson, Ltd., Hackbridge Electric Construction Co., Ltd., Lancashire Dynamo & Crypto, Ltd., Mather & Platt, Ltd., C. A. Parsons & Co., Ltd., and A. Reyrolle & Co., Ltd.

A vote of thanks to the chairman was proposed by Mr. H. E. Midgley (Brush Electrical Engineering Co.), seconded by Mr. C. Hollander (English Electric Co.) and passed with acclamation.

At a subsequent meeting of the new Council the following firms were co-opted members of the Council: W. H. Allen, Sons & Co., Ltd., A.I. Electric Welding Machines, Ltd., Birlec, Ltd., British Thomson-Houston Co., Ltd., Ferranti, Ltd., General Electric Co., Ltd., and Newton & Wright, Ltd.

Mr. E. C. Holroyde and Sir Harry Railing were unanimously re-elected chairman and vice-chairman respectively for the next session, and Mr. V. Z. de Ferranti and Mr. W. W. Hughes were elected additional vice-presidents.

Hot-water Supplies

A DRAFT Code of Practice (3.431) on "Centralized Domestic Hot Water Service" (storage) has been prepared by a committee convened by the Institutions of Mechanical Engineers and of Heating and Ventilating Engineers and issued for comment (by May 28th) by the British Standards Institution at 5s., post free (81 pages).

Temperatures, thermal insulation and heat emission required for various purposes are among the points considered, which are mainly mechanical, although Sub-Code 3.4315 (5 pages) relates specifically to electrically driven circulating pumps. In regard to electric water heaters, it is stipulated that these shall operate within plus or minus 6 per cent of declared voltage in urban districts and 8 per cent in rural districts.

Sales Management

Papers at E.D.A. Conference

FOLLOWING the opening address by MR. V. W. DALE (director and secretary) at the sales management conference organized last week by the British Electrical Development Association in London, MR. J. I. BERNARD (chief technical officer, E.D.A.) presented a paper on "Electricity in the Post-War House." Mr. Bernard paid particular attention to Government requirements in this matter and also put the point of view of electricity supply authorities. He summarized the proposals for improved solid-fuel heating installations and referred to electricity's role in such cases; he thought that a small house with one coal fire would need about 1,500 kWh of electric heating a year. Consumption for water heating in the six summer months would be 1,820 kWh. The author stressed the need for low heat loss construction of all-electric houses and flats. He considered that, on balance, it was preferable that appliances should be purchased by the housing authority if suitable arrangements were made for maintenance.

Space-Heating Developments

"Space Heating Prospects" was the title of a paper by MR. E. M. ACKERY (E.D.A.). In it the author reviewed the influence of the war upon space heating, viz., the scarcity of coal, the demand for better heating, concentration of building upon houses and schools, the position of electric heating as a supplement to solid-fuel heating, the possibilities of the heat pump and district heating. Mr. Ackery considered that the best field for thermal storage heating lay in the moderate sized building where the amenities and labour saving had a relatively high value for the building owner. Possible developments of direct heating were floor heating and high-temperature radiant heating as a supplement to background heating (electrical or other) in commercial buildings. The heat pump would seem to be particularly applicable to open-air swimming baths and in air-conditioned buildings. District heating schemes were unlikely to affect electric heating prospects vitally as the buildings concerned would otherwise have solid-fuel heating and electricity would still be used for occasional and "topping-up" purposes. There were possibilities in the use of back-pressure turbines in combined electric power and waste heat stations.

As regards new houses, Mr. Ackery reviewed the general arrangements in temporary and permanent prefabricated and in new "ordinary" houses and showed that the role of electricity would be mainly "topping-up." Prospects for electric heating were in some ways better in existing houses with inadequate background heating. He considered that there were excellent prospects for electricity in greenhouse and soil heating if the matter were actively pursued. Dealing with school heating the author mentioned the alternative methods and made special reference to the possibility of the use of low-level electric fires. He concluded with an appeal for more statistics regarding the running costs of electric heating installations.

MR. J. B. ASHWORTH (Blackburn Electricity Department) contributed a paper on "Sales Development," which he emphasized was a highly-skilled technical job involving training and characteristics of a very high order. He outlined a sales organization which would survey consumers' requirements, analyse load conditions, decide upon suitable tariffs, compare capital costs and anticipated revenue and canalize all necessary details to enable quick and efficient service to be given.

MR. PHILIP HONEY (E.D.A.), dealing with "Electric Water Heating Development," showed that before the war the tendency in the northern areas was to favour immersion heaters and in the south self-contained heaters. The expanding use of electricity for water heating was adequate proof that it is economically priced to command a share of the load. After explaining why an electric geyser was not favoured and pointing to the advantages of the "two-in-one" water heater, Mr. Honey showed that wartime experience had killed the bogey of "high cost." The "built-in" water heater was recommended to electricity supply engineers, especially where space was a consideration and total cost must not be excessive.

Farm Supply Economics

In a paper on "Load Building on the Farm," MR. C. A. CAMERON BROWN (Edmundsons) said that although there was a general impression that farmers were clamouring for electricity there were still a very large number who had to be convinced of the benefits of electricity and this was the task of the supply authorities. "High-pressure" salesmanship was taboo; the man on the job should know something of the farmers' work.

The average revenue from farmers was too low to be healthy and in the author's opinion a running charge of 1d. was satisfactory, with, if possible, a reduced rate for special-time or thermostatically-controlled loads. The aim must be to make each application as economically satisfactory to the farmer as possible, and to keep the capital outlay and the load demand on the system as low as possible.

MR. NORMAN H. BRIDGE (Lancs Electric Power Co.) presented a paper on "Local Advertising," in which he contended that although undertakings had little apparatus to

sell at present it was a mistake not to continue to advertise electrical service regularly. He mentioned the aid afforded by E.D.A. in local advertising and suggested that the old basis of 1 per cent of revenue as the amount to be spent on publicity work should be doubled. He also suggested that for the rest of this year each undertaking should provide the money to cover local press advertising and at least six well-designed window displays, in co-operation with others or individually. Every undertaking should have a trained advertising and display assistant.

Methods of handling press publicity were dealt with in three papers: "The Women's Press" by Mary Gilbert; "The Technical Press" by J. Rosslyn-Stuart; and "The National and Local Press" by J. M. Fraser.

Other papers presented were: "Contact with the Architectural Profession" by F. A. Yerbury; "Modern Trends in Lighting" by J. A. Prowse; "Local Exhibition Service" by C. Warrenne; "E.D.A. Post-War Advertising Campaign" by S. E. Shelton; and "E.D.A. Salesmanship Training Course" by A. MacIntosh.

Cookers for New Houses

Production Agreements and Specifications

IN order to speed up and simplify the production of equipment required for housing purposes, the Ministry of Supply is concluding production, or "blanket order," agreements with the various industries concerned to ensure that adequate production is secured for the needs of the housing programme and that suitable articles are made available to local authorities at controlled prices.

The articles covered by blanket orders will be manufactured in accordance with standard specifications approved by the Ministry, but to ensure that production is maintained while manufacturers are engaged in "tooling up" for the "specified" article, which will be known as the "N.H.D." (National Housing Drive) type, existing models which conform most nearly to the specified type are being accepted in the meantime.

A variety of articles will be covered; to date, the Ministry has completed arrangements for the production of gas and electric cookers. Arrangements are being made to avoid as far as possible delays in delivery due to particular firms being overloaded with orders. It is hoped that local authorities will take the fullest possible advantage of the "blanket order" system by specifying the articles covered by it.

The specification for the electric cooker provides that it shall be of the manufacturers' standard designs which agree in general with the dimensions and requirements below. The cooker shall be of a type and size normally installed for all ordinary small households, and may be of free standing or inset type. The overall dimensions shall conform to B.S. 1195—i.e. 21 in. wide, 36 in. high by 19-21 in. deep. (Manufacturers' existing standard models approximating to these dimensions may be acceptable at the discretion of D.G.H.S./Ministry of Supply.)

The cooker shall comprise an oven, warming cupboard, grill boiler and at least one boiling plate. All mechanical parts shall be efficiently bonded to the earthing terminal and each cooker must bear the maker's name and/or identification number in a visible position.

All metal parts shall be vitreous enamelled or suitably processed against corrosion. The visible exterior shall be finished in mottled grey vitreous enamel of acid resisting quality. Where doors comprise framed panels, the panels shall be finished in white vitreous enamel. Light alloys used in the construction must be treated with an approved protective finish.

The cooker shall be equipped with a grill pan and grid, an oven pan and at least two oven grid shelves. An instruction card shall be supplied. The oven capacity shall not be less than 1,850 cu. in., and the oven shall be arranged to accommodate thermostatic control, if so desired. Boiling plates and grill boilers shall, where possible, comply with the Specification for the Interchangeability of Replacement Parts issued by the British Electrical Development Association. (Manufacturers' existing standards may be accepted on current models.) Boiling plates shall be of the cast-iron enclosed (two or three circuit), line voltage tubular radiant (one, two, or three, circuit) or low-voltage transformer-operated radiant types.

The following makers are at present operating under the blanket order for electric cookers. The catalogue reference numbers of their existing models which have been accepted by the Ministry of Supply pending the switch-over to the production of the "N.H.D." model are shown in parentheses:—Elexcel, Ltd. (K. 105); Belling & Co., Ltd. (43.A); Jackson Electric Stove Co., Ltd. (92.J.—later, 192. J. and 192. J.G.*); English Electric Co., Ltd. (H. 212 or Ali. Cooker); Carron Co., Ltd. ("Carronade"); Moffats, Ltd. (Model 42); Falk, Stadelmann & Co., Ltd. ("Raydex," R. 6); Falco Electrical Appliances, Ltd. (Model 15); British National Electrics, Ltd. (Model C. 6); Simplex Electric Co., Ltd. (R. 294); General Electric Co., Ltd. (D.C. 438—later D.D. 112/3*); Revo Electric Co., Ltd. (R. 8); Tricity Cookers, Ltd. (777 M); Parnall Aircraft, Ltd. (special to N.H.D.*); South Wales Switchgear, Ltd. (special to N.H.D.).

* Not yet in production but deliveries will commence by July, 1946.

ELECTRICITY SUPPLY

Chichester Inquiry. Hammersmith Bulk Supply.

Accrington.—FACTORY SUPPLIES.—A sum of £19,224 for the extension of the distribution system, mainly to supply factories at Church and Oswaldtwistle, has been sanctioned.

Belfast.—REPRESENTATION AT CONVENTION.—The Ministry of Commerce has now agreed to two members of the Electricity Committee and the city electrical engineer attending the annual convention of the I.M.E.A. at Blackpool in June. Originally the Ministry would agree to only one member and the engineer going to the conference.

Billingham-on-Tees.—HIRE OF APPLIANCES.—In our issue of May 3rd it was incorrectly stated that the North-Eastern Electric Supply Co. is to hire cookers at 2d. a week and kettles and irons at 1d. a week. The company is hiring a set of four ground-base pans at 2d. a week, an electric kettle at 2d. and an electric iron at 1d. a week.

Bolton.—RELIEF OF RATES.—The Corporation has asked the Electricity Committee to provide £10,000 out of the surplus for 1945-46 towards rate relief.

Burnley.—HIRE-PURCHASE.—Amended hire-purchase terms are announced by the Gas and Electricity Departments. The minimum cash price of an appliance sold on hire-purchase is £3 as against £1 before the war, and the proposed terms for hire-purchase are the cash price plus 10 per cent where the hire-purchase period is for three years, 7½ per cent for two years and 5 per cent for one year.

Cardiff.—EXTENSION OF ROATH STATION.—Sanction has been obtained to borrow £300,279 for extensions at Roath power station.

STREET LIGHTING.—The Corporation has obtained sanction to borrow £10,000 for conversion of street gas lamps to electricity.

Chelsea.—GRIT NUISANCE.—The Parliamentary Committee reports that tests have been made in an endeavour to trace the cause of the heavy deposits of grit emitted from the chimneys of the London Passenger Board's power station in Lots Road. These tests, which have been carried out in co-operation with the L.C.C., are now complete and indicate that the nuisance largely arises from the unsuitable grade of coal allocated to power stations by the Ministry of Fuel and Power.

Chichester.—INQUIRY INTO OVERHEAD LINES.—Proposals by the Electricity Committee to erect overhead lines to supply isolated agricultural properties in the Sidlesham area were the subject of an inquiry held by Mr. A. D. Erskine for the Electricity Commissioners. The cost of the first scheme was stated to be £534 towards which the owners had agreed to contribute £170. By underground cable the cost would be £1,306 and the owners would have to contribute £936. The second scheme would cost £174 (overhead) and £483 (underground), the contributions by the owners being £50 and £358 respectively. Mr. E. H. Skinner, city electrical engineer, pointed out that farmers were experiencing great difficulty in getting labour unless the cottages were electrified. The amenities gained by residents of these isolated areas, he contended, far outweighed the loss by having overhead lines. For the Chichester R.D.C., who were objecting, it was stated that they were apprehensive that the present policy would lead to a network of overhead lines "like a tramway system."

Clydebank.—STREET LIGHTING CONVERSION.—The Town Council is to convert the lights of Barns Street from gas to electricity at a cost of £1,601.

Exeter.—REBATE "NOT ENOUGH."—By 29 votes to 26 the Town Council referred back a recommendation of the Electricity Committee that a rebate of ¼d. per kWh should be granted to lighting flat rate consumers in the city. It was suggested that the proposed concession was not enough, and mention was made of the £20,000 income tax paid out of last year's profits. On behalf of the Committee it was stated that charges had been maintained at the pre-war level and considerable expenditure would be incurred in the near future.

Hammersmith.—BULK SUPPLY ARRANGEMENTS.—In reply to representations made, the Central Electricity Board has stated that there is no incident in the Board's experience where the continuity of supply would have been improved (except in the case of war damage) by the two cable feeders to an undertaking being laid along separate routes. No occasion is known when the failure of one of two e.h.v. cables in the same trench has caused damage to the other circuit sufficient to interrupt the supply on that circuit. It is recognized good engineering practice to lay two cables in one trench, and would be unjustifiable extravagance to do otherwise. The supply to Hammersmith has been given by the present method for fourteen years and the Board's records disclose only one occasion when the security of supply might have been improved by the suggested interchangeability of feeders and transformers.

London.—LAG IN REVENUE.—The Finance Committee of the London and Home Counties Joint Electricity Authority reports that the lag in revenue due to continuous meter reading at December 31st last was £231,977, an increase of £31,064 on the 1944 figures.

Norwich.—RENEWAL OF DISTRIBUTORS.—The Electricity Committee is to renew low-voltage distributors and connect existing services at a cost of £55,000. Supplies are to be provided at the Leckenham estate (£16,000), Costessey (£2,700), Attleborough (£2,700), and Wymondham (£700).

Preston.—INSPECTION OF UNDERTAKING.—The first annual inspection of the Corporation electricity undertaking since 1939, took place on May 2nd. When the new station is completed at the end of 1947, at a cost exceeding £3,800,000, the undertaking will have a capital value of £7,000,000. The Mayor, Alderman H. E. Rhodes, chairman of the Electricity Committee, said the undertaking supplied an area of 204 sq. miles and had 1,037 miles of cable and 364 substations. The reserve balance

was £255,000, and only in 1940 was there a loss. There were 50,000 consumers. Mr. C. T. S. Arnett (Central Electricity Board) said that not a single war factory in the North-West had had to close down through lack of electrical energy, but if more men were not released for large firms producing electric plant there would be a danger next winter of factories having to close suddenly through lack of power.

Salford.—CHANGE-OVER.—The Light, Heat and Power Committee is seeking sanction to borrow £18,559 for the change-over and standardization of voltage.

Stirling.—6-kV CABLE EXTENSION.—Proposals costing £18,870 for extensions to the burgh's 6-kV cable network, first instalment of a d.c. to a.c. change-over, have been adopted by the Town Council.

Surbiton.—PUBLIC OWNERSHIP RESOLUTION.—The Town Council has decided to support a resolution recently passed by the Twickenham Council in which it strongly favours public ownership of the electricity supply industry on the understanding that local distribution is entrusted to representatives nominated by local authorities in the respective distribution areas, subject to any necessary central co-ordinating control.

Sutton Coldfield.—SUPPLY TO HOUSES.—The Electricity Committee is to extend the mains to housing estates at a cost of £14,135.

Swansea.—METER TESTING.—The Electricity Committee is to erect a new meter-testing station at the Strand at a cost of £10,000.

DISTRIBUTION.—The distribution system is to be extended at a cost of £136,366.

Wakefield.—STREET LIGHTING SCHEME.—The Corporation is considering a five-year plan for the conversion of the city street lighting from gas to electricity.

Watford.—NEW FEEDER.—To meet requests for supplies of electricity near the L.M.S. Railway junction station a new feeder and certain ancillary plant and cables are necessary. The Electricity Committee has decided to seek sanction to borrow £20,980 for the scheme.

FRINGE ORDERS.—The Electricity Committee is raising no objection to a Fringe Order authorizing the Northmet Power Co. to supply the Beeches estate, Elstree. The Northmet Co. has approved a Fringe Order enabling the Corporation to supply premises in Bellfield, Abbots Langley.

Overseas

Australia.—CHANGE-OVER TO A.C.—At a cost of £283,750 for mains, substations and services and £572,000 for the replacement of consumers' apparatus all the remaining d.c. system in the city of Sydney is to be converted to a.c. supply.

Eire.—RURAL ELECTRIFICATION.—Replying to a question in the Dail, the Minister of Industry and Commerce (Mr. Lemass) said that the Electricity Supply Board was about to begin work on the first area in the rural electrification scheme. It was intended to proceed with further areas as rapidly as the supply of the necessary materials would permit. An investigation into the problems involved in the use of concrete "pylons" was at present proceeding There was a shortage of wood poles, native or foreign. It was expected that supplies of transformers, insulators, meters, etc., would be available as required.

United States.—HIGH-VOLTAGE TRANSMISSION.—The American Gas & Electric Power Company is planning to erect an experimental power line for long-distance transmission at a voltage of 500 kV. Two 1½-mile lines are to be erected near the Tidd generating station of the Ohio Power Company at Brilliant, Ohio. Special instruments will be used to investigate the corona loss and various conductors, insulators, etc., will be tested under all types of weather conditions.—*Reuter.*

TRANSPORT

Glasgow.—NEW TRAMS.—One hundred bogie-type tramcars are to be constructed at Coplawhill Car Works at a rate of three a week.

Newcastle-on-Tyne.—RAILWAY SIGNALLING.—A £300,000 improvement scheme to be carried out at the Central Station by the L.N.E.R. includes the concentration of points and signals in a new cabin. Colour light signalling is to replace the existing semaphore system and route relay interlocking will be used throughout.

Forthcoming Events

Monday, May 13th.—*Coventry.*—Technical College, 7 p.m. I.E.E. South Midland Students' Section. "Power Line Carrier Communication," by D. W. Harling, and "Some Aspects of Total Loss Iron Testing at Power Frequencies," by S. P. Roper.

Tuesday, May 14th, to Thursday, May 16th.—*London.*—Institution of Electrical Engineers. Convention of the Illuminating Engineering Society.

Wednesday, May 15th.—*Worcester.*—Corporation Recreation Club Rooms, Hylton Road, 7.30 p.m. Electrical Power Engineers' Association, Midland Technical Group. "Integrating Meters—Accuracy Levels," by M. Whitehead.

Friday, May 17th.—*Manchester.*—Physics Lecture Theatre, The University, 7 p.m. Joint meeting of the Institute of Physics and the Institution of Electronics. "Electronic Semi-Conductors," by Dr. R. W. Sillars.

Central Library, St. Peter's Square. British Association of Chemists. Annual lecture. "The Social Implication of Recent Discoveries regarding Atomic Energy," by Prof. Blackett.

Dundee.—Training College Hall, Park Place, 7,30 p.m. I.E.E. Scottish Centre. Faraday Lecture by Dr. T. E. Allibone.

Saturday, May 18th.—*London.*—I.E.E. London Students' Section. 9.30 a.m. Visit to C.E.B. Central Control Room, Southwark.

Connaught Rooms, Great Queen Street. 1 for 1.30 p.m. Junior Institution of Engineers. Annual luncheon.

Leeds.—Electricity Department Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. Luncheon, annual general meeting and film afternoon.

Manchester.—Engineers' Club, Albert Square, 3 p.m. Association of Supervising Electrical Engineers (Manchester Branch). Annual report, by R. H. L. Andrew.

Arc-Welding Generators

Discussion at I.E.E. Installations Section

OPENING the discussion of the paper by MESSRS. J. C. MACFARLANE, J. W. MACFARLANE and W. I. MACFARLANE on "Direct-Current Arc-Welding Generators and Systems," presented to the Installations Section of the Institution of Electrical Engineers, MR. D. B. HOSEASON said there had been a good deal of theorizing, but what did the operator himself think about it? It appeared that in the case of quite unskilled workers and for a few limited applications, the single-operator d.c. circuit was the one favoured. The experienced welder who had been on the job for many years showed a preference for a.c. equipment, although for 80 or 90 per cent of his jobs he did not care one way or the other. On the whole, welding with multi-operator sets was not in favour, but that might have been incidental inasmuch as the multi-operator generators were not as satisfactory as they might have been. His conclusion was that if he had to start up a complete new welding shop with 50, 60 or 100 operators, he would be inclined to put in about 60 per cent a.c. welding plant and 40 per cent d.c.

The one thing that stood out from the paper was the argument as to the laminated *versus* the non-laminated field system. The former had certain physical characteristics which made it fairly easy to construct with a compensated winding to kill the armature reaction. But the laminated field system involved a high labour content in the cost of the machines, and the authors considered that a machine having a fully compensated laminated field structure had a light weight and therefore a low cost. This did not necessarily follow. The labour content, particularly in the case of small machines, of 5 or 10 kW, was quite considerable and it was not right to suggest that because these machines were small they were cheaper.

Effect on Distribution System

MR. J. GOGAN (Clyde Valley Electric Power Co.) said that the statement that the revenue on a kW basis obtained from single rotaries could be three to five times that possible from static transformer plant was very important from the power supply engineer's point of view. Single-phase static transformer sets could have a very adverse effect on the distribution system; during the war supply authorities were instructed more or less to shut their eyes to interference from welding equipment, but he felt sure the Regulations would soon be enforced again.

MR. H. WEST (Metropolitan-Vickers Electrical Co., Ltd.), said a good deal of attention was being given to the possibility of classifying electrodes by "drop frequency," but it was too soon yet to try to give an answer. At the moment he thought the possibility of such a classification was open to doubt because the transfer of the metal across the arc must depend on the position in which the operator was welding. In the horizontal position, gravity obviously played a part, but what happened when welding vertically? Did the drops draw themselves up by surface tension? Despite what the authors said, a.c. multi-operator sets were gaining considerable favour. He himself had always used a.c. multi-operator sets and d.c. single-operator sets, but on the question of cost the former was the more attractive proposition.

Electrode designers had not yet managed to make rods for welding certain metals which would run satisfactorily on a.c., but where a.c. rods were available he thought the multi-operator set was the one which would become popular. Nevertheless, d.c. had a big field where a.c. supply was not available, such as in certain overseas areas where machines had to be engine driven. A belief was gaining ground quite rapidly that a.c. welding at higher frequencies than 50 was very desirable and 150 cycles was considered likely in the future. In America, which was all d.c., before the war, they were changing to a.c.

Importance of Overall Efficiency

MR. A. E. VILLIERS (Quasi-Arc Co., Ltd.) thought the fact that the authors had found the overall efficiency of the single-operator drooping-voltage-characteristic generator to be about 70 per cent was a more important achievement than improvements to dynamic characteristics, in view of the fact that modern electrodes provided the necessary arc stability and easy starting to a much greater degree than was the case in the past. It was implied in the paper that the use of inductance in the arc was harmful because of the risk of shock to the welder on the occurrence of transient charges and also the possibility of burning through thin plate when welding light work. He had never heard of welders even feeling a slight shock when using d.c. with reactances of normal design, and he could not help thinking that inductance would rather assist the welding of thin plate than otherwise, which in any case needed a specially trained operator. He doubted whether the diversity of arc welding loads could be determined with mathematical accuracy. Whilst agreeing with the suggested use of higher frequencies, he doubted whether 150 cycles was high enough to give ease of striking the arc at low voltages. At 400 or 500 cycles he believed the advantages would be very marked with regard to economy in kVA and general ease and smoothness of welding.

MR. E. W. HARDING (Ministry of Supply Advisory Service on Welding) said he could not quite understand the rather disparaging view

of the transformer set. Some power companies seemed to be prejudiced against a.c. welding loads, but very few of them had experienced much trouble from them. Indeed, he considered that the possibility of trouble had been very largely exaggerated and that the supply authorities should accept those loads. LT. COL. S. E. GLENDENNING thought there was a tendency to place too much importance on the cost of the plant and the cost of the current and too little on the resultant welding.

DR. H. G. TAYLOR said that as the title of the paper included "Systems," reference should have been made to rectifiers. They had distinct advantages, particularly with regard to stability and an extremely quick response if a short circuit took place when the drop of molten metal passed across from the electrode to the job.

In reply, DR. J. W. MACFARLANE, commenting on the fact that the majority of speakers said there was no such thing as unbalanced phases, said that five weeks ago he was in a shop on the Clyde where there was a separate three-phase welding supply. There were 24 single-phase transformers of a well-known make in use and at the time he was there the ammeters on the individual phases read 21, 170 and 55 amperes. He therefore left his audience to judge.

Heavy-duty Truck

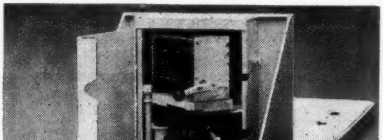
New Battery-driven Model

TO the range of battery driven "Electricars" obtainable from CROMPTON PARKINSON, LTD., Electra House, Victoria Embankment, London, W.C.2, has been added an armoured 2-ton truck for heavy duty in steel works, foundries, docks and similar rigorous service. The armouring protects the driver against accidental blows from swinging loads, or collision when manœuvring in areas congested by heavy machinery, and is a safeguard in respect of the employer's liability for injury to his workers. The power equipment is designed for severe conditions and also protected by armoured enclosures.

The welded-fabricated frame has outer plates of deep section forming a collision band. Shroud plates protecting the driver and control gear are welded in to form part of the structure. The deck consists of steel chequer plate in three hinged sections which open to expose the whole of the battery and undercarriage. The driver's foot-plate is surrounded at the outer edge by a heavy channel member welded into the main structure.

The deck measures 7 ft 6 in. by 3 ft 9 in.; distortion is prevented by support battens fitted beneath all edges of the deck plates, resting on continuous flanges in the main frame. The coil springs are designed to close solidly without failure in the event of the load being placed completely out of centre.

Long loads of timber or steel bars can be accommodated on the clear length of deck provided on one side of the truck in consequence of the non-central position of the driver's platform. The truck is built to withstand occasional loading up to twice normal tonnage; for smooth riding over rough roads special springing and large diameter, wide tread, tyres are employed. The springing is progressive, having a greater rate of deflection with light than with heavy loads. Sunken rail tracks



Electric truck for steelworks, docks, and other heavy-duty work

and gulleys are traversed with the minimum of vibration to the truck and load.

Cables are in conduit and exposed terminals are fitted with rubber gaiters; rubber bushings of a compressed type exclude moisture from anchor pins and shafts. Mechanically-operated contactors controlled by an exterior handle give three speeds in either direction. To prevent indiscriminate reversing, there is an additional separate lever which ensures a pause before reversing the direction of travel.

The brake is of the transmission type, released by depressing the pedal, which also controls a switch to prevent the motor being energized until the brake is fully released, thus providing "dead man" control. Once the brake has been operated to stop the truck, it cannot be started again unless the control handle is in the neutral position, so ensuring the correct sequence of speed control.

The control gear and mechanism are enclosed in padlocked or bolted casings. The battery container is of sheet steel on angle framing fitted with sockets to engage tapered rubber bushes on location bolts passing through the main frame. These bushes insulate the container and battery from service shocks.

The truck will travel about 14 miles on one battery charge at a speed of about 5 m.p.h., on the level when fully laden. It is 9 ft 7 in. long overall and 3 ft 9 in. wide, the platform height being 2 ft when laden.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Electric Supply Corporation, Ltd.—In his address at the annual meeting Mr. A. J. Fippard (chairman) said that "nationalization" could only mean either national ownership or national control. Regarding the former, he could see no advantages but many disadvantages. As to the latter, greater control could with advantage be applied by a strengthened Electricity Commission. The two vital changes which should be brought about without delay were the rearrangement of distributing areas and the introduction of a uniform basis of charge for electricity supplied in bulk by the C.E.B.

The St. Austell and District Electric Lighting & Power Co., Ltd., reports that while development work undertaken during the year ended December 31st last was limited, sales of electricity continued to increase and amounted to 12·3 million kWh, as compared with 10·6 million in 1944. After providing for depreciation and all expenses the profit was £18,285 (£17,031). Provision for taxation is increased from £11,390 to £13,000 and £1,000 is again transferred to the general reserve. A final dividend of 6 per cent, making 10 per cent for the year, is to be paid, and £7,727 (£7,892) is carried forward. A statement by the chairman, Lord Merthyr, says that a substantial programme of development work has now been put in hand.

Richard Johnson & Nephew, Ltd.—The accounts for the year to March 31st show a trading profit of £163,696 against £146,293 for the preceding year. Depreciation absorbs £55,218 (£43,042) and taxation, after crediting E.P.T. refund, £20,581 (£31,080), a sum of £50,000 (£34,700) being transferred to general and contingencies reserves. The dividend is maintained at 9 per cent and £47,175 (£42,505) is carried forward. Figures for last year are on an adjusted basis, the form of the accounts having been revised.

Ever Ready Co. (Great Britain), Ltd.—Subject to final audit, the net profit for the year to March 31st is given as £651,019, against £588,935 for the preceding year. The final ordinary dividend is 25 per cent, making 40 per cent (same), and in addition it is proposed to pay a Victory capital bonus of 5 per cent out of a net capital profit of £257,422 realized in cash on the sale of a minority shareholding in an associated company. This bonus is not returnable for income tax or surtax.

Ultra Electric (Holdings), Ltd.—Letters of rights have been issued for the offer to ordinary shareholders of 125,000 new ordinary 5s. shares at 7s. 6d. each in the ratio of one new share for every eight 5s. stock units held on May 1st. The new shares rank for the full dividend which may be paid for the year ending June 30th, 1946. Application will be made to the Stock Exchange for permission to deal in the new shares.

British Oxygen Co., Ltd.—The parent company's income for 1945, after providing for E.P.T., was £1,588,747 (against £1,400,155) and the net profit was £520,587 (£370,369). Besides maintaining the ordinary dividend at 16 per cent by a final payment of 8 per cent, it is proposed to distribute a special anniversary dividend of 4 per cent. The allocation to general reserve is £100,000 (£150,000) and £80,445 (£86,874) is carried forward.

The Marconi International Marine Communication Co., Ltd., is paying a final dividend of 5 per cent, making 7½ per cent (same) for the year ended December 31st. After providing for taxation the net profit was £90,925 (£90,138).

Hopkinsons, Ltd., have recommended a final ordinary dividend of 15 per cent, making 20 per cent for the year ended January 31st (same). After provision for tax and crediting £8,700 E.P.T. recoverable the net profit was £102,093 (£89,498).

The Telephone & General Trust, Ltd., has announced a final dividend of 5 per cent on the ordinary stock (again making 8 per cent for the year) and a dividend of 8 per cent on the "A" ordinary. Net profits for 1945 amounted to £121,491 (£120,463).

The British Vacuum Cleaner & Engineering Co., Ltd., has declared an interim dividend of 6¼ per cent, compared with 12½ per cent last year.

Tube Investments, Ltd., has declared an interim dividend on the ordinary stock of 10 per cent and at the same rate relatively on the liaison ordinary shares.

Ransomes, Sims & Jefferies, Ltd., propose to pay a first and final ordinary dividend of 7½ per cent, the same as last year.

Callender's Trust, Ltd., have declared a dividend of 5 per cent, the same as last year. The net profit was £32,048 (£31,575).

Allen West & Co. Ltd., from a net profit of £47,771 (against £50,197) are paying a dividend of 7½ per cent (same) on the ordinary shares.

The West London & Provincial Electric Trust, Ltd., has recommended a final dividend of 4 per cent, making 6 per cent for the year (same).

The Southern Areas Electric Corporation, Ltd., is increasing its ordinary dividend from 5 to 5½ per cent.

The Rawlplug Co., Ltd., proposes to pay a final dividend of 30 per cent, making 40 per cent (same). The net profit, after taxation, was £66,455 (£65,830).

New Companies

Doric Electrical Co., Ltd.—Private company. Registered April 5th. Capital, £600. Objects: To carry on the business indicated by the title. The directors are:—V. Southon, 14, Crabtree Lane, S.W.6, and two others. Registered office: 14, Crabtree Lane, S.W.6.

Electromaint, Ltd. — Private company. Registered April 4th. Capital, £3,000. Objects: To carry on the business of electricians, mechanical engineers, manufacturers and repairers of all kinds of electrical apparatus and appliances, etc. The directors are:—G. N. Ainsworth, 2,

Stafford Road, Eccles, and four others. Registered office: 67, Lees Road, Oldham.

T. W. H. Electrical Co., Ltd.—Private company. Registered April 1st. Capital, £500. Objects: To carry on the business of electrical, constructional and general engineers, etc. Directors: W. C. J. Jocelyn, 8, Montrave Road, Penge, S.E.20, and two others. Registered office: 8, Montrave Road, Penge, S.E.20.

Sydney Husband, Ltd.—Private company. Registered April 10th. Capital, £2,000. Objects: To acquire the business of a radio and electrical engineer carried on by Sydney S. Husband at Ropergate, Pontefract. Directors: S. S. Husband, Carleton Road, Pontefract, and R. S. Ridley, Doncaster Road, Pontefract. Registered office: Ropergate, Pontefract.

Wholesale Supplies (Swinton), Ltd.—Private company. Registered April 10th. Capital, £2,000. Objects: To carry on the business of electrical engineers, general electrical installation contractors, manufacturers of electrical appliances, etc. Directors: H. Agnew, 419, Chorley Road, Swinton, and four others. Registered office: Walshaw House, 16, Worsley Road, Swinton.

W. Kingsbury, Ltd.—Private company. Registered April 16th. Capital, £3,000. Objects: To acquire the business of electrical and radio engineer heretofore carried on by W. Kingsbury at 45, King Street, Carmarthen. Directors: W. Kingsbury (permanent managing director), Drllwyn, Cwmfffrwd, Carmarthen, and J. E. Stephens, 11, The Avenue, Carmarthen. Registered office: Angel House, Lammas Street, Carmarthen.

Triad, Ltd.—Private company. Registered April 16th. Capital, £600. Objects: To carry on the business of electricians, electrical and mechanical engineers, etc. Directors: E. G. Squires, 60, High Street, Thornton Heath, and two others. Registered office: 106, Imperial Parade, Brighton Road, Purley, Surrey.

A. J. Chitty & Son, Ltd.—Private company. Registered April 17th. Capital, £1,000. Objects: To carry on the business of electricians, electrical contractors, radio, electrical and mechanical engineers, manufacturers of, and dealers in, wireless apparatus, etc. Permanent directors: A. J. Chitty, 53, Cranmore Lane, Aldershot, and two others. Secretary: A. J. Chitty. Solicitors: Herrington & Carmichael, Aldershot.

Dawes Radio & Electric, Ltd.—Private company. Registered April 16th. Capital, £4,000. Objects: To acquire the business of a wireless and electrical engineer carried on by R. M. Dawes at 41, South Street, Dorchester, as "R. M. Dawes." Directors: Lt. Col. R. M. Dawes, 93, Damers Road, Dorchester, and two others. Registered office: 41, South Street, Dorchester.

J. Thomas Electrical Products, Ltd.—Private company. Registered April 16th. Capital, £2,000. Objects: To acquire the business of a manufacturer of radio and television equipment and electrical engineer carried on by A. J. Thomas at Fairlawn Wharf, 44, East Saint Helen Street, Abingdon, Berks. Directors: Sir Esmond Ovey, Culham Manor, Culham, Oxon, and two others. Registered office: Fairlawn Wharf, 44, East Saint Helen Street, Abingdon.

L. R. Jervis, Ltd. — Private company. Registered April 12th. Capital, £1,000. Objects: To carry on the business of electrical and radio engineers, distributors, dealers and agents, electricians, etc. Directors: L. R. Jervis, 103, Belvedere Road, Wallasey, and C. T. Taylor, 23, Magazine Lane, Wallasey. Registered office: 62, Seaview Road, Wallasey.

Building Electrical Service Co., Ltd.—Private company. Registered April 15th. Capital, £500. Objects: To carry on the business of electrical engineers and general electrical installation contractors, lighting specialists and contractors, wireless engineers and service agents, etc. Directors: E. Olliver, 22, Wynchgate, Harrow Weald, and J. J. Swain, 54, Whitegate Gardens, Harrow Weald. Registered office: 27, Station Road, Harrow.

R. H. Carson, Ltd.—Private company. Registered in Belfast April 9th. Capital, £3,000. Objects: To acquire the business of an electrical engineer and contractor and manufacturer of, and dealer in, electrical apparatus and equipment now carried on at 54, Dublin Road, Belfast, as "R. H. Carson." R. H. Carson, 3, Wandsworth Road, Belfast, is the first director. Registered office: 54, Dublin Road, Belfast.

Proberts (Equipment), Ltd.—Private company. Registered April 8th. Capital, £500. Objects: To acquire the business of an electrical engineer and contractor carried on by L. G. H. Hollingum at 186, Bowes Road, New Southgate, N.11. Subscribers: Margaret C. Probert, Bevills, Bures, Suffolk, and L. G. H. Hollingum, 18, Derwent Road, N.13. Solicitors: Hamilton, Hill & Evershed, 3, Alderman's Hill, N.13.

J. Smith & Co. (S.S. Batteries), Ltd.—Private company. Registered April 18th. Capital, £3,000. Objects: To carry on the business of manufacturers and repairers of, and dealers in, electrical accumulators, batteries, acids and containers, manufacturers of, and dealers in, wireless sets, etc. Permanent directors: A. Williams, 84, Shenstone Valley Road, Quinton, Birmingham, 32, and H. J. Williams, 132, Birch Road, Hagley Road West, Birmingham. Registered office: Bridge Street, Cradley, Worcs.

P.H. Supply Co., Ltd.—Private company. Registered April 17th. Capital, £1,000. Objects: To carry on the business of sellers and distributors of all types of electrical and radio equipment at home and abroad, etc. Directors: P. J. Preston, 15, Asmuns Place, N.W.11; and D. Hume, 8, Denman Drive, N.W.11. Registered office: 33, Henrietta Street, W.C.2.

M.G. Electrical Co., Ltd.—Private company. Registered April 17th. Capital, £1,000. Objects: To carry on the business of electrical engineers and contractors, etc. The directors are: W. Mudie, 127, Russell Road, Wimbledon and F. E. Gray, 337, Haydons Road, Wimbledon. Registered office: 66, High Street, Wimbledon, S.W.19.

Bankruptcies

R. J. Thurlow, electrical engineer, 27, Fore Street, Ipswich.—Receiving order made April 26th on debtor's own petition.

STOCKS AND SHARES

STOCK Exchange business continues active; both investment and speculation keep members of the House fully employed. The general tendency of prices is upwards. Fresh opposition to the nationalization proposals of the Government is brought forward by the Association of British Chambers of Commerce, which argues that the two forms of transport, rail and road, can be operated on a sound economical and financial basis. The Ever Ready Company provides its shareholders with a pleasant surprise in an extra 5 per cent capital bonus, not returnable for income tax or surtax. This is in addition to the final dividend which makes 40 per cent for the year ended last March. Revival of interest in Cossor shares brought about a sharp rise in the price.

Rails and Transport

Some people go so far as to doubt whether nationalization of the Home railways will ever take place, but the Government pronouncements have left no doubt as to the official intention to carry out the plan as soon as possible. Meanwhile, the London Passenger Transport Board has decided to proceed with its previously announced policy of expansion. This, it is assumed, is likely to involve the raising of fresh capital.

Southern preferred at 76½ is 30s. higher and the 5 per cent preference at 112½ is 10s. higher on the week. Transport "C" has gone back a point to 59.

Price Fluctuations

Central Electricity stocks are about a point better and London Passenger 5 per cent "B" stock at 118½ has gained the fraction. Home electricity supply ordinary shares show no change. In the overseas list, Victoria Falls ordinary are up ⅛ at 107s. 6d. The changes in the miscellaneous market include rises in Christy Brothers, 2s. 6d. up at 82s. 6d.; Enfield Cables, 67s. 6d.; Ever Ready 52s.; International Combustion, 3s. 9d. higher, 8⅛; Reyrolle, 2s. 3d. better at 77s. 6d.; Siemens 43s.; Tube Investment 6¼ and Westinghouse Brake £4, up 2s. 6d. and 3s. respectively. Allen West at 10s. have gained 6d. On the other hand, Vactrics, at 28s., lost 3s. of their last month's 10s. British Vacuum Cleaner at 35s. are down 2s. 6d., the interim dividend, of 6¼ per cent comparing with 12½ per cent a year ago.

Shares on Offer

There are obtainable at present 1,500 Telegraph Construction shares at £3, which yield at that price £3 6s. 8d., and 2,000 Telephone Manufacturing, which give a yield at 15s. 6d. of £2 18s. per cent on the money. Ward & Goldstone are on offer as to 1,000 shares at a little under £2. At the latter figure the yield is £3 2s. 6d. per cent. Enfield Cables at 67s. 6d. pay £3 14s. and Henley's at 29s. give £3 9s. Automatic Telephones at 78s. afford £3 4s. From these examples it will be clear that the buyer of to-day looks ahead to the likelihood of an increase in dividends as time goes on. Moreover, the cheap money policy of the Government has the effect of driving capital into what may be termed gilt-edged ordinary shares of companies engaged in any industry which has the assurance of progressive success.

Radio and Television

The market in Radio and Television Trust (formerly Philco Corporation) was disturbed to some extent by the company's decision to defer consideration of the preference dividend due on May 1st until final agreement with the Government on the settlement of wartime contracts. It appears that large sums are involved, and profits of the year will be substantially affected by the result of the negotiations. At 9s. 6d. the shares show a loss of ⅛ since the preference dividend statement. The preference stand at 19s. 9d. Pye deferred, on the other hand, are ⅛ higher on the week, at 41s. 3d. A new issue is expected to be made shortly. The shares will probably be offered at a bonus price to the company's shareholders. E.M.I. eased off to 34s. 3d. Decca Records recovered to 61s. 3d.

Cable & Wireless

After the flurry which accompanied the appearance of the White Paper on the nationalization of Cable & Wireless operating companies, prices of the holding company's stocks have settled down in the neighbourhood of 103½ for the ordinary and 116½ for the 5½ per cent preference. Although below the best, these quotations are substantially higher than they were before the Government announcement. Since then has come the further news of the proposal to sell to English Electric the interest in Marconi's Wireless Telegraph. The holding company's stocks remain subject to the twin uncertainties of, on the one hand, the scale of compensation to be paid for the subsidiaries; and, on the other hand, the company's future after the latter have been taken over by the Government.

English Electric Deal

The pronounced strength developed during April in English Electric shares had appeared to herald the appearance of some important development. Having risen 11s. to 66s., in advance of the announcement, the shares have since shown little change on the company's proposal to buy from Cable & Wireless (Holding) the whole of that company's interest in Marconi's Wireless Telegraph, except the latter's shares in Cable & Wireless, Ltd. The sum involved has not been disclosed, and before becoming effective the deal has to obtain the sanction of the Treasury and the Capital Issues Committee, as well as the approval of stockholders of the two parties to the sale. English Electric shares are on a 3 per cent yield basis.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

T. ATHERTON.—" Air heating and ventilating systems." 6484. April 22nd, 1943. (576723.)

Babcock & Wilcox, Ltd., and C. H. G. Haywood.—" Mechanical stoker-fired combustion apparatus." 12796. July 5th, 1944. (576809.)

K. S. Binnie.—" Device for securing electric wire." 8330. May 3rd, 1944. (576759.)

British Thomson-Houston Co., Ltd.—" Radio frequency transformers." 10750/44. June 5th, 1943. (576768.) " Electrical terminal supports." 8441/44. May 5th, 1943. (576801.)

British Thomson-Houston Co., Ltd., and D. S. Morfey.—" Kinematograph projectors." 9196. May 13th, 1944. (576764.)

British Thomson-Houston Co., Ltd., and F. Widnall.—" Permanent magnets." 7772. April 26th, 1944. (576754.)

C. C. Buckle.—" Recording and reproduction of sound on films." 2278. February 8th, 1944. (576778.)

Callender's Cable & Construction Co., Ltd., and H. T. Gooding.—" Apparatus for detecting faults in electric cables." 17066. September 6th, 1944. (576708.)

Callender-Suchy Developments, Ltd., and C. T. Suchy.—" Electrical insulators having conducting parts." 9568. May 18th, 1944. (576802.)

C.A.V., Ltd., and T. Curzon.—" Thermostatic switches for controlling electric circuits." 4778/45. October 6th, 1944. (Divided out of 568714.) (576821.)

Compagnie pour la Fabrication des Compteurs & Matériel d'Usines à Gaz.—" Generators of vibrating currents." 5531/42. February 11th, 1941. (576719.)

Equipment & Engineering Co., Ltd., and H. B. Swift.—" Magnetizing devices for the detection of cracks." 16668. September 1st, 1944. (576817.)

T. G. Farish.—" Electric plug and socket connectors." 5908. March 30th, 1944. (576696.)

General Electric Co., Ltd., V. J. Francis and E. R. Thomas.—" Means for producing flashes of light." 8546. March 17th, 1939. (Addition to 508241.) (576685.)

General Electric Co., Ltd., H. G. Jenkins and E. E. Miles.—" Sockets for electric discharge lamps." 14221. July 25th, 1944. (576706.)

Heenan & Froude, Ltd., and C. T. Hayes.—" Eddy current brakes, dynamometers and clutches." 12633. September 8th, 1942. (576689.)

S. I. Hitchcock.—" Magnetic work holders." 22117. November 9th, 1944. (576710.)

Hoover, Ltd.—" Suction cleaners." 10534/44. May 12th, 1943. (576703.)

T. A. Hopkins.—" Slidable electric switches particularly for torches and portable lighting appliances." 8002. April 28th, 1944. (576798.)

Linde Air Products Co.—" Automatic control systems for electric welding machines." 160/44. January 27th, 1943. (576736.)

Marconi's Wireless Telegraph Co., Ltd.—" Reactance control circuits." 3174/44. February 25th, 1943. (576780.) " Variable permeability tuning apparatus." 5460/44. March 24th, 1943. (576787.)

Miles Aircraft, Ltd., and L. C. Heal.—" Electric motor drive units." 7277. April 19th, 1944. (576797.)

Rylands Bros., Ltd., R. S. Brown and A. Brierley.—" Electro-chemical surface cleaning of metal articles." 6112. April 1st, 1944. (576698.)

Simms Motor Units, Ltd., and J. Ayres.—" Manually operable snap-action electric switches." 19739. October 13th, 1944. (576819.)

Standard Telephones & Cables, Ltd.—" Inductor element." 6005/44. April 5th, 1943. (576791.)

Standard Telephones & Cables, Ltd. (International Standard Electric Corporation).—" Electrical signalling system." 9824. May 22nd, 1944. (576804.)

Standard Telephones & Cables, Ltd., E. A. H. Bowsher, H. M. M. d'Assis-Fonseca, and H. J. Ward.—" Electric signalling systems." 6003. March 31st, 1944. (Addition to 514991.) (576790.)

A.K.G.B. Thornberg.—" Rotary pumps, rotary compressors or the like." 6859/44. May 13th, 1943. (576795.)

Westinghouse Electric International Co.—" Manufacture of electron-discharge and similar devices." 5792/44. April 24th, 1943. (576749.)

M. P. Winther.—" Automatic speed control apparatus for eddy current slip clutches." 3128/42. March 19th, 1941. (576718.)

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be made within one month of May 1st:—

FOSECO. Class 7. No. 639197. Air compressors, atomisers, electric welding machines, vacuum pumps and other machines.—Foundry Services, Ltd., trading as W. H. Ferris & Co., 285, Long Acre, Nechells, Birmingham, 7.

AVO. Class 9. No. 635898. Electrical instruments and apparatus not included in other classes; apparatus, instruments and devices for use in radio reception and transmission, television, sound producing, reproducing, recording, receiving, transmitting and amplifying; scientific, cinematographic and optical apparatus and instruments; and parts (not included in other classes) of such goods.—Automatic Coil Winder & Electrical Equipment Co., Ltd., Winder House, 21, Douglas Street, S.W.1.

NYLUC. Class 9. No. 638889. Covers for electric switches; pushes and push-buttons for electrical apparatus; directional compasses, advertising apparatus and signs included in Class 9.—Plastic Structures, Ltd., 16, Chase Side, Southgate, N.14.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our 'Official Notices" section the date of the issue is given in parentheses.

Abertillery.—May 18th. Urban District Council. Three-phase four-wire overhead lines. (See this issue.)

Atherton.—May 31st. U.D.C. Cables and transformers. (May 3rd.)

Australia.—June 17th. Bowen Town Council, Queensland. 1,000-kW turbo-alternator. A. E. Axon, consulting engineer, Parbury House, Eagle Street, Brisbane.

Birkenhead.—May 14th. Electricity Department. Cables, meters and general stores for twelve months. (April 26th.)

Bury.—May 11th. Corporation. Concrete lighting standards, sodium lamp control equipment and 65-W lanterns. (May 3rd.)

Ealing.—May 20th. Electricity Department. 1,000-kVA and 7,500-kVA transformers and 11-kV switchgear. (May 3rd.)

Town Council. May 27th. Electrical installation work for 238 houses. (See this issue.)

India.—June 28th. Madras Government Electricity Department. 15,000-kW turbo-alternator for Basin Bridge "B" power station. (May 3rd.)

New Mills.—May 31st. Electricity Department. Transformers. (See this issue.)

Redcar.—May 18th. Electricity Department. Electrically-driven van. (See this issue.)

Reigate.—Town Council. May 31st. Wiring of 96 houses. (See this issue.)

North Scotland.—May 20th. Hydro-Electric Board. 11-kV overhead lines, Loch Fannich area. (May 3rd.)

June 10th. High- and low-voltage overhead lines, Bute and South Cowal, and on the island of Lewis. (May 3rd.)

Oldbury.—May 17th. Town Council. Mercury discharge street lighting. (May 3rd.)

Plymouth.—May 15th. Electricity Supply Department. Conveyor belts, electric motors and control gear, substation distribution boards and accessories and alkaline battery for switchgear closing and tripping. (May 3rd.)

Sheffield.—May 27th. Electricity Department. One reinforced concrete cooling tower for Neepsend generating station. (April 26th.)

Stockton-on-Tees.—May 18th. Electricity Department. H.v. and l.v. cables of C.M.A. manufacture, h.v. switchgear, l.v. switchgear and transformers. (See this issue.)

Orders Placed

Birkenhead.—Electricity Committee. Accepted. Transmission line.—B. I. Callender's Cables. One 5,000-kVA and four 500-kVA transformers.—Yorkshire Electric Transformer Co. One 400-kVA transformer.—Transformers & Welders, Ltd. Switchgear.—Switchgear & Cowans; A. Reyrolle.

Burnley.—Electricity Committee. Accepted. Cable for Woodbine housing estate (£3,391).—Scottish Cables. Nine transformers (£2,995).—Bonar Long & Co.

Deptford.—Highways Committee. Accepted. Victory illuminations (£350).—Pearce Signs, Ltd.

Liverpool.—Electric Power & Lighting Committee. Recommended. Four 100-Ah single-phase meter test sets (£1,390).—Metropolitan Vickers. Four 100-A rotating sub-standard meters (£183).—Chamberlain & Hookham. Modification of substation equipment (£3,005).—Ferguson, Pailin.

Manchester.—Housing Committee. Accepted. Electrical installations in 417 houses on the Baguley estate.—H. C. Taylor & Co.

Sheffield.—Electricity Committee. Accepted. Supplies for twelve months: Cables.—W. T. Glover. Transformers.—Bonar Long; Electric Construction Co.; Hackbridge. Switchgear.—Crompton Parkinson; A. Reyrolle.

Watch Committee. Accepted. Lamp pillars.—Revo Electric Co. (200 at £4 19s. 6d. each); Poles, Ltd. (500 at £4 6s. each).

Southgate.—Highways Committee. Accepted. 48 lanterns (£4 1s. 3d. each).—W. Sugg & Co.

South Shields. — Corporation. Accepted. Electrical installations in 230 houses (£5,060).—J. Calvert, Seaham.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Ashbourne.—Houses (50), for U.D.C.; J. H. Fryer, Ltd., builders, Great Northern Road, Derby.

Ashford (Middlesex). — Extensions, County hospital (£210,625); county architect.

Barnes.—Four blocks of temporary municipal offices, Hampton Square, Mortlake; W. R. Shepherd, borough engineer and surveyor, 289, Sheen Road, Richmond.

Barrow-in-Furness.—Houses (88), Greengate Street North; J. N. Flitcroft, borough surveyor, Town Hall.

Bath.—Houses (88), on the Moorlands estate; city engineer, Guildhall.

Bathavon.—Houses (75), for R.D.C.; Grayson & Goldsmith, architects, 7, Bridge Street, Bath.

Battersea.—Houses (40), Shaftesbury Park estate; Artizans & General Dwellings Co.

Blocks of flats, Bolingbroke Grove, Honeywell Road and Mayford Road; borough engineer.

Belfast.—Offices, showrooms and stores, Frederick Street, for J. P. Corry & Co., Ltd.; W. H. Stephens, 13, Donegall Square North.

Birkenhead.—Houses (54), Bedford Avenue estate (£66,192); Peak Construction Co.

Birmingham.—Block of shops, offices and showrooms, corner of New Street and Bennett's Hill (£100,000); J. Cotton, architect.

Blackley.—Houses (34), Kirkway and Inverness Avenue; Greenwoods Building Industries, Ltd.; P. G. Kelvey, architect, 379, Moss Lane East, Manchester, 14.

Bolsover.—Permanent houses (£25,886), Oxcroft Lane; H. James (Mansfield), Ltd., builders, Station Street, Mansfield.

Burghead.—Eleven blocks of houses, Hopeman Road; J. & W. Wittet, architects, 81, High Street, Elgin.

Bury.—Houses (164); Fairfield estate; Leyland Construction Co., Ltd., builders, Leyland.

Chelmsford.—Houses (36), Springfield estate (£40,860); Amalgamated Building Contractors, Ltd., London.

Cheshunt.—Houses (48), Bury Green estate (£56,950); H. C. Leach, builder, Southfield Road, Waltham Cross.

Chester.—Works extensions, Sealand Road; Arthol Manufacturing Co., Ltd.

Chesterton.—First instalment of new hospital (£37,000); county architect, Shire Hall, Cambridge.

Colne Valley.—Houses (50), Botham Hall, Golcar; Lunn, Heppenstall & Lunn, architects, 3, Station Road, Milnsbridge.

Docking.—Houses (66), for R.D.C.; F. Ward, housing officer, Station Road, Docking, King's Lynn.

East Kesteven.—Houses (54), for R.D.C.; architect, Council Offices, Northgate, Sleaford.

Grantown-on-Spey.—Houses (24), for Town Council; A. & E. Cattanach, architects, Kingussie.

Guildford.—Houses (44), Bellfields estate; borough engineer.

Hornsey.—Cottages (34), Annington Road, off Fortis Green Avenue; J. H. Melville-Richards, borough engineer and surveyor, Town Hall, Crouch End.

Kettering.—Ten blocks of houses, Stamford Road estate; borough engineer, Gold Street.

Leicester.—Houses (250), New Parks estate (£260,976); Sherriff & Co., Ltd.

Ludlow.—Permanent houses (56), for R.D.C.; J. Brian Cooper, architect, 177, Corporation Street, Birmingham, 4.

Lydney.—Houses (36), for R.D.C.; H. Russell, surveyor, 63, High Street.

Manchester.—Bus station, Victoria Buildings site; city architect.

Houses (24), Higher Crumpsall, Emmerson Carr, Ltd., builders; Wheeler, Wood & Hobson, architects, 26, King Street.

March.—Extensions, County Library, Gordon Avenue; R. D. Robson, county architect, County Hall.

Middlesex.—Nurses' home extension, Clare Hall Colony (£12,128); H. E. Winskell & Son, Ltd.

Nurses' home, Central Hospital (£37,500); county architect.

Mirfield.—Permanent houses (34), Kitson Hill; surveyor, Council Offices.

Perth.—School, including assembly hall, library, dining hall, two gymnasia, swimming pool, spray baths, etc., for Perthshire Education Committee; D. Howat, director of education.

Pontypool. — Houses (40), Garndiffaith (£49,484); W. Arthur, Ltd., builders, Snatchwood Road, Abersychan.

Poplar.—Houses (60), Abbott Road area (£82,320); Comben & Wakeling, Ltd., Harrow.

Rotherham. — Factory, Eastwood trading estate; Jay-Zed Gowns, Ltd.

Factory, Tenter Street; W. Jackson & Son, Ltd.

Works extensions, Grange Mill Lane; British Acheson Electrodes, Ltd.

Royton.—Houses (20), for U.D.C.; Oldham & District Building Trades Employers' Association, 16, Clegg Street, Oldham.

St. Ives.—Permanent houses (50); G. L. Day, town clerk, 18, The Broadway.

St. Marylebone.—Flats (140), Church Street, and 172 flats, Barrow Hill Road; T. J. Wilson, Town Clerk, Town Hall.

Salford.—Works extensions, Blossom Street; J. W. Jackman & Co., Ltd., foundry engineers, Blackfriars Road.

Shipley.—Houses (50), West Royds and Crag Road (£53,000); U.D.C. surveyor.

Southall.—Houses (100) on the Dormers Wells estate; borough engineer and surveyor, Town Hall.

Southgate.—Flats (42), Green Lanes; R. H. Brine, 121, Green Street, Sunbury-on-Thames.

Spenborough. — Houses (60), for U.D.C. (£60,086); H. Barraclough & Son, builders, Wesley Street, Morley, near Leeds.

Staveley.—Dining centre and kitchen at grammar school for Derbyshire Education Committee; F. H. Crossley, county architect, St. Mary's Gate, Derby.

Stepney.—Houses (133) and 300 flats, Limehouse Fields housing scheme; B. W. Stuttle, borough engineer and surveyor, Municipal Offices, Duval Street.

Wandsworth.—Houses (30), Magdalen Park estate (£32,088); Holloway Bros., Ltd., builders, Millbank, London, S.W.1.

Watford.—Houses, Willow Way, Radlett (£25,100); W. J. Wiggs & Co., Ltd., builders, Radlett.

Export Inquiries

WE have received the undermentioned inquiries from firms and individuals overseas who wish to secure agencies for British electrical equipment and appliances or to import them into their territories. We shall be glad to pass on to them replies received from readers which should be addressed to the Editors, quoting the number given in parentheses. We cannot vouch for the standing of inquirers and manufacturers replying to them will no doubt require the usual references:—

Ceylon.—A Colombo firm of agents and merchants is interested in the importation of spotlights with colour discs, electrically controlled, projectors for advertisement slides, rubber gauntlets for l.v. and h.v. use, electro-medical appliances, carbon-filament lamps, photo-flood and dark-room lamps, projector lamps, etc. (X.153.)